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[1 *front*]

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HE MINERALOGICAL MAGAZINE

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. 186 September, 1944 Vol. XXVII

Banalsite, a new barium-felspar from Wales.

By W. Campbell Smith, M.C., T.D., M.A., Sc.D.,
F. A. Bannister, M.A., F.Inst.P., and Max H. Hey, M.A., D.Sc.
Department of Mineralogy, British Museum.

With an appendix by A. W. Groves, D.Sc., Ph.D., M.I.M.M., F.G.S.

(With Plate IV.)

[Read November 4, 1943, and June 8, 1944.]

N 1941 the Home Ore Department of Iron and Steel Control, Ministry of Supply, took over the old Benallt manganese mine at Rhiw in the Lleyn ninsula, Carnarvonshire. A new shaft was sunk and a new mine was veloped among and mainly below the old workings. It was in one of the old rkings of Benallt that Mr. (now Sir) Arthur Russell discovered in 1911 the ll-crystallized specimens of celsian and paracelsian recently described by Dr. J. Spencer.[1]

Dr. A. W. Groves of the Mineral Resources Department of the Imperial Insti-e and geologist to the Home Ore Department had had a sharp look-out kept the reappearance of the barium-felspars in the new workings, and when thin nds of coarsely crystallized but compact, white 'sparry' minerals were found one of the ore-bodies he sent specimens to the Department of Mineralogy of the itish Museum for investigation. His watchfulness for the rare minerals was well varded, for the bulk of the white mineral in the specimens he sent proved to be leed a barium-felspar, but differing quite definitely from any known barium-spar, and it is in fact a new mineral of very considerable interest.

The name proposed for this mineral is *banalsite*, suggested by its chemical rmula $BaNa_2Al_4Si_4O_{16}$. It is the first example of an alumino-silicate of barium ntaining sodium as the dominant alkali. Though chemically related to the spars, X-ray photographs show that its symmetry is orthorhombic. The space-oup is either *Iba* or *Ibam*, with cell dimensions, a 8·50, b 9·97, c 16·73Å., from ich may be calculated the axial ratios $a : b : c = 0{\cdot}853 : 1 : 1{\cdot}678$. The density, rrected for included water and in vacuo, is 3·065, from which the cell contents calculated to be $4[BaNa_2Al_4Si_4O_{16}]$.

The specimens in which the new mineral was discovered came from ore on the ot-wall side of no. 1 ore-body by no. 1 Chute, 50–60 feet west of the main shaft d some 10–20 feet above the 130-foot level. These were found in July 1943.

[1] L. J. Spencer, Min. Mag., 1942, vol. 26, pp. 231–245.

Since then some further specimens have been found forming a thin layer betwe the 'bedding planes' of no. 2 ore-body towards the foot-wall side. This ore-bo lies 40 to 80 feet west of the Court shaft, and dips east at about 60°.

In the original find the material containing the minerals forms a band 1·5 c thick, compact and rather coarsely crystalline, traversing dark, spotted ma ganese ore. Less distinct, narrow, white veins parallel to the main band impr nate the ore for a further thickness of 1–2 cm. and then die out, successive veinl getting thinner as their distance from the main 'vein' increases.

The main 'vein', broken parallel to its contact with the ore, consists of compact aggregate of crystals of the new mineral associated with calcite, a f very small patches of baryte, and criss-crossed by dark, narrow, blade-li crystals of tephroite and alleghanyite up to 2 cm. in length and varying in th ness from 2 mm. down to microscopic dimensions.

Included within the 'vein' minerals are some small angular fragment opaque, black, magnetic ore which prove to be rich in manganese and which a identified from X-ray powder photographs as jacobsite. Small interstices a minute veins are filled by zeolitic material consisting of natrolite with a sec zeolite not certainly identified.

The calcite is irregularly distributed. In parts of the specimens it forms visi crystal plates, but in other parts may be found only filling interstices betwe edges of crystals of the new mineral, which it appears to be partly replacin Baryte was observed only under the microscope in thin section as relics of crystal plate surrounded and perhaps partly replaced by calcite. In specime from the second find mentioned above baryte is quite abundant both as ve material and as a very thin crystallized crust.

Banalsite is pure white in colour and translucent to transparent in thin flake On broken surfaces, cleavages show a good pearly lustre and are traversed by fi lines, which are the traces of a second cleavage at right angles to the first. Indiv dual crystal plates, traversed by blades of tephroite and alleghanyite, occasional measure 1 cm. across, but for the most part they are much smaller (pl. IV, fig. 1 They show no twinning. Minute cavities, many showing a gas bubble and ther fore doubtless liquid-filled, are very numerous. It is on account of these that water determination was made on the second sample analysed and the densit was corrected for included liquid. The abundance of these inclusions causes so of the specimens to be opaque and milky in appearance.

The only crystals which were found to show indications of faces were two see in thin sections. These were measured on the universal stage and the positions the faces with relation to the principal vibration-directions were plotted an compared on a stereographic projection with the positions of the poles of possib faces of the mineral calculated from the axial ratios obtained by X-ray measur ment.

In one crystal three edges are the traces of (110), (112), and (001). The face (110) and (001) are both parallel to good cleavages. In the second crystal (110) again represented and is parallel to a cleavage : two other edges correspond ver well with (121) and ($\bar{1}$21), a third is clearly (212), and a very narrow face i much less confidently identified as (5$\bar{1}$2).

The only other indications of crystal form are rather well-marked planes c black dusty inclusions which are quite commonly seen within the irregula

ındaries of crystals of the new mineral in fine-grained veins which traverse the (fig. 1A). The orientation of these planes in several of the crystals was deter-ıed on the universal stage, and comparison with the stereographic projection . 1B) showed that they correspond to planes with indices:

Crystal 1: (121), (212), (2$\bar{1}$2), and (0$\bar{1}$1).
„ 2: (001), (112), (110), and a steep pyramid, possibly (342).
„ 3: (111), (1$\bar{1}$1).
„ 4: (012), (0$\bar{1}$2).

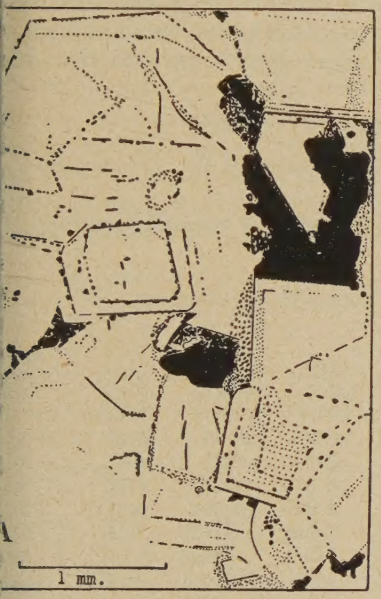


FIG. 1A

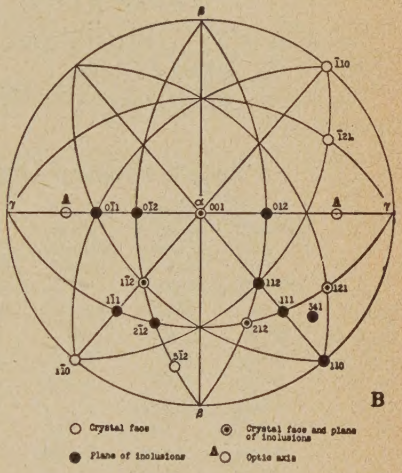


FIG. 1B

FIG. 1A. Thin section of aggregate of banalsite crystals showing zonal inclusions. The black areas are manganese ore.

FIG. 1B. Stereographic projection of the crystal-forms and optical orientation of banalsite. (341 in error for 342.)

The cleavages are identified as (110) and (001). The prismatic cleavage seems be the easier to produce of the two, but it has been noted that in thin section ry few crystals indeed develop the cleavages parallel to both the faces of the sm. This general tendency for only one of the two prismatic cleavages to pear gave a false impression that extinction-angles were inclined to the promi-nt crystallographic planes and masked the orthorhombic symmetry until this s revealed by the X-ray study.

The optical orientation and value of the optic axial angle have been determined numerous measurements on the universal stage which gave:

$$\alpha = c, \beta = a, \gamma = b. \quad 2V\ 41° \pm 3°, \text{ positive.}$$

The angle between the cleavage (110) and γ, the acute bisectrix, is found to be

50°, agreeing within half a degree of the value, 49° 32′, calculated from the c dimensions.

The refractive indices were measured by the Becke method using a sodiu light lamp. The immersion liquid was changed until the closest possible agr ment in refractive index was obtained, and the index of the liquid was measu on a Bellingham & Stanley standard refractometer standing beside the mic scope. The objective used was Leitz 3, N.A. 0·25, ×10. Measurements were ma on each of the two specimens of the mineral which had been used for chemical a X-ray analysis. All (110) cleavages give α, but only (001) cleavages give γ and and this proved to be a difficult cleavage to obtain in fragments suitable refractive index measurements. Only one set of readings was obtained for β, a this is not considered satisfactory. The average values of the refractive indi obtained at 16–17° C. were:

α 1·5695, β 1·5710, γ 1·5775, all $\pm$0·0005.

The value of $\beta - \alpha$ calculated from the mean value of 2V, 41°, and of γ 0·008, is 0·001, giving β 1·5705.

The mineral is decomposed by HCl (1 : 1) leaving a colourless residue. T hardness is 6.

TABLE I. Physical properties of barium-felspars compared.

	Hyalophane C, Kaso mine. (Yosimura)	Hyalophane A, Kaso mine. (Yosimura)	Hyalophane, Jakobsberg. (Strandmark)	Banalsite, Wales.	Kasoite, Kaso mine. (Yosimura)	Celsian, Jakobsberg. (Strandmark)	Celsian, Wales. (Spencer)	Paracelsian Wales. (Spence
BaO %	7·60	9·02	12·4	21·99	25·50	36·45	38·94	38·53
Na_2O %	0·98	1·72	1·5	8·43	1·85	0·77	nil	0·15
K_2O %	8·80	6·35	9·9	0·66	5·10	0·22	0·18	0·54
Sp. gr.	2·78	2·78	2·756	3·065	3·003	3·384	3·31	3·29
α	$1·538_0$	$1·537_8$	...	1·5695	$1·564_5$	1·5835	1·580	1·570
β	$1·542_0$	$1·542_5$	...	1·5710	$1·568_5$	1·5886	...	1·582
γ	$1·544_5$	$1·546_0$	1·5426	1·5775	$1·572_0$	1·5941	1·590	1·586
2V	75·0°	75·5°	77·5°	41°	80·5°	86° 22′	near 90°	50° 3
Sign	negative	negative	...	positive	negative	positive	positive	negati

T. Yosimura, Journ. Fac. Sci. Hokkaido Univ., Ser. 4, 1939, vol. 4, pp. 378, 381. [M. 7–412.]

J. E. Strandmark, Geol. För. Förh. Stockholm, 1903, vol. 25, pp. 298–316; 1904, vol. p. 110.

L. J. Spencer, Min. Mag., 1942, vol. 26, pp. 235, 236, and 240.

Composition and unit-cell contents of banalsite.

Chemical analyses were made of two specimens of banalsite; the first (I) i timately associated with alleghanyite, tephroite, and calcite, was purified hand-picking, magnetic treatment (the alleghanyite and tephroite are readi attracted by the electro-magnet), flotation with methylene iodide and then wi bromoform, extraction with dilute (3 %) acetic acid, and a final hand-pickin the second specimen (II) was part of a cleavage mass, and after removal manganese oxides by hand-picking was examined microscopically and found be pure apart from abundant liquid inclusions. Impurities in both specime (apart from water) are estimated at less than 1 %.

The analyses were made on samples of 20–40 mg. by standard microchemical thods and presented no special difficulties. The portion used for alkalis gave heck determination of SiO_2 and Al_2O_3; in table II, the means of these are given, h the individual determinations below.

The densities of both specimens were determined by the flotation method on powder used for the analysis; that of the second sample has been corrected the water found on analysis, but that of the first sample could not be so rected and is probably low by about 0·02.

The unit-cell contents are given in columns Ia and IIa together with their ximum probable errors. It will be seen that they lead unambiguously to an al repeat of $Ba_4Na_8Al_{16}Si_{16}O_{64}$, with a small but distinct replacement of Si by of Al by Mg, of Na by K, and of Na and Ba by Ca; these substitutions are tinctly greater than the most probable analytical error, though the substitution Mg for Al is just less than the maximum probable error. It may be noted that ile calculation as empirical unit-cell contents, with due allowance for probable or, gives the most positive proof of isomorphous replacements, it is not a very ısitive method for the detection of small, probable replacements; for that rpose, calculations to an assumed integral basis are better suited.

ABLE II. Chemical analyses and unit-cell contents of banalsite. (Analyst, M. H. Hey.)

	I.	II.		Ia.		IIa.		Ideal.
$_2$ ...	35·75	34·74	Si ...	15·4±0·7	31·1 ±1·1	15·2±0·6	32·0 ±1·0	16
O_3 ...	29·13	31·20	Al ...	14·8±0·7		16·1±0·6		16
) ...	22·73	21·99	Mg ...	0·7		0·7		—
) ...	1·76	0·81	Ba ...	3·8±0·2	12·6 ±0·7	3·8±0·2	11·7 ±0·7	4
) ...	1·11	1·00	Ca ...	0·7		0·4		—
) ...	0·28	0·03	Mn ...	0·1		0·01		—
,O ...	8·92	8·43	Na ...	7·5±0·6		7·1±0·6		8
) ...	0·75	0·66	K ...	0·4		0·4		—
) ...	n.d.	1·08	O ...	62·4‡		63·2±1·2		64
	100·43	99·94						
^{6}	3·027±0·015*	3·065±0·005†						

ndividual determinations in analysis I, SiO_2 35·58, 35·93, Al_2O_3 28·78, 29·48, Na_2O 8·90, 5; analysis II, SiO_2 34·11, 35·38, Al_2O_3 31·14, 31·26, H_2O 1·12, 1·05. * Not corrected for luded water and probably low. † Corrected for water present as inclusions. ‡ Limits, l to 64·2.

Calculation of the effect on the repeat of a given analytical error is quite a ıple matter, but has rarely been attempted, though it is very desirable in cing isomorphous substitutions of small extent. With essential constituents is quite straightforward, but where the analytical error may concern an im-rity (as in the present instance, absorbed water), it must not be forgotten that e density will be affected, and through it all the unit-cell contents. The neces-y calculations have been made for the analyses of banalsite, assuming a possible ror of ±0·5 % in the SiO_2, Al_2O_3, BaO, and Na_2O, and ±0·2 % in the H_2O of alysis II. These figures are probably considerably in excess of the true errors, at st so far as the better analysis (II) is concerned, but it appears best to allow iberal margin of error. Since water was not determined in analysis I, it is cessary to assume that as much as 1 % might have been present. To these alytical errors, which amount to ±0·9 % on the oxygen in analysis II, and

+1·5 to −0·7 % in analysis I, must be added the physical errors in the cell siz and in the density determination (as distinct from the uncertainty in the dens correction due to possible error in the water determination): these may amou to ±1 % in all constituents in analysis II, and ±1·3 % in analysis I. It shou be noted that the analytical errors cannot be simply summed, since a loss of x of *A* causes an apparent increase in the numbers of every other atom in t repeat, and the error in, for example (Si+Al+Mg), is less than the sum of t individual errors.

X-ray examination of banalsite.

It has already been shown that the chemical composition, specific gravity, a optical properties distinguish banalsite without difficulty from the bari felspars and establish its claim to rank as a new species. An X-ray study w undertaken first of all to determine the symmetry, unit-cell dimensions, a atomic contents, and also to investigate the relationship of banalsite to t felspars.

Cleavage fragments of the mineral selected for optical work yielded t specimens suitable for X-ray photographs. One could be set with the directi of the obtuse bisectrix vertical and the other with the obtuse bisectrix parallel the X-ray beam. Laue photographs revealed orthorhombic symmetry, the fi showing one horizontal plane of symmetry perpendicular to the direction of t obtuse bisectrix, and the second two planes of symmetry at right angles (pl. I fig. 2). These photographs were then used to set the fragments for rotati photographs about the three axes *a*, *b*, and *c* in turn which yielded approxima unit-cell dimensions and served to fix the orientation of the optical indicatr (fig. 1B). A series of oscillation photographs was next indexed completely. A the diffractions observed obeyed the conditions $(h+k+l)$ always even; $(hk0)$ on for $(h+k)$ even; $(h0l)$ only for h even and l even; $(0kl)$ only for k even and l eve Banalsite therefore possesses a body-centred lattice and may belong to either the two space-groups $C_{2v}^{21} = Iba$ or $D_{2h}^{26} = Ibam$. Using the higher orders $(h00)$, $(0k0)$, and $(00l)$ indexed on oscillation photographs, the unit-cell dimensio were found to be *a* 8·50, *b* 9·97, *c* 16·73Å. The rotation and oscillation phot graphs about the *c*-axis possess weak, odd-number layer-lines with relatively fe spots, thus indicating a pseudo-cell of half the size, but possessing the sa space-group symmetry.

At first sight there was no very obvious relationship between the unit cells banalsite and the felspars. In the plagioclase series it is the 7·2Å. axis which doubled for the more calcic members. If banalsite is built up on a similar tetr hedral framework then probably the axis 16·73Å. is the direction of the continuo four-ring chains; in other words, the *c*-axis of banalsite corresponds to the *a*-a of sanidine.

In discussing the crystal-structure of sanidine, Taylor[1] makes use of an alte native face-centred unit cell $a' = [102]$ 13·2, $b' = [010]$ 12·9, $c' = [\bar{1}00]$ 8·4Å β 100°. A cell of similar dimensions can be derived for banalsite in which a' [110] 13·1, $b' = [1\bar{1}0]$ 13·1, $c' = \frac{c}{2}$ 8·37Å.; [110] $[1\bar{1}0] = 99°$. This cell, like t larger sanidine cell, would be all face-centred. This dimensional relationsh probably indicates the similarity of the silicon-aluminium-oxygen network in t

[1] W. H. Taylor, Zeits. Krist., 1933, vol. 85, pp. 425–442. [M.A. 5-473.]

structures. A complete crystal-structure investigation would be necessary to firm this and to discover the positions of the barium and sodium atoms.

During the course of the chemical analyses by Dr. Hey, samples of both specimens that he analysed were submitted for powder photographs. Table III gives list of spacings and relative intensities.

LE III. X-ray powder data for banalsite. Spacings in Ångström units and estimated nsities. Taken with unfiltered copper radiation λ 1·539Å. in a cylindrical camera, 6 cm. diameter.

6·38	w	2·63	w	1·761	w	1·247	vw
5·64	vw	2·54	m	1·699	m	1·215	vw
5·00	m	2·43	w	1·628	w	1·163	vw
4·21	m	2·36	w	1·588	w	1·096	w
3·77	m	2·28	w	1·546	m	1·074	vw
3·49	s	2·15	m	1·468	mw	1·053	w
3·18	s	2·07	s	1·427	m	1·044	vw
3·06	w	1·983	w	1·391	m (doublet)	1·032	vw
2·98	m	1·948	w	1·343	w		
2·88	m	1·888	w	1·318	w		

Associated minerals.

The chief interest in the associated minerals attaches to the tephroite and ghanyite. Before describing these in detail a brief account must be given of second find of banalsite near the foot-wall of no. 2 ore-body referred to above. re the banalsite is found occurring in thin, flat slabs no more than a centimetre ck. The banalsite is white and opaque; it is associated with baryte in small ount and includes a few small crystals of tephroite. The flat slabs are in places rusted with a thin, cream-coloured coating on which are minute crystals of yte and also harmotome, the latter as crystals only 0·03 mm. across. This thin st is again coated with a film of botryoidal psilomelane, and beads of psilolane are seen on some of the minute baryte crystals. Specimens found in the ne ore-body in November 1943 show a mineralized band in which cleavage tes of baryte pervade the ore. Some pearly cleavages of banalsite can be ected among the baryte crystals and a thin section shows a granular aggregate banalsite, baryte, and calcite distributed through and including patches of que manganese ore with much brown mica and small crystals of tephroite. the colourless minerals contain abundant hair-like crystals which have not n identified, and both the baryte and banalsite contain abundant liquid lusions, many of which contain gas bubbles. Flanking the zone with the rsely crystallized baryte the ore contains several bands 1–2 mm. wide which sist mainly of crystals of tephroite with some banalsite and much opaque ore. l brown mica. The tephroite of these bands shows frequent intergrowths of ghanyite, though less well-developed than in the original specimen. The ore ociated with these specimens is dark purplish-brown. Close to the baryte band s not magnetic, but at 3 cm. from this, where the narrow bands of tephroite found, it strongly attracts the compass needle.

Jacobsite.—In the first specimens received the magnetic property possessed certain bands and small patches of the ore has been traced definitely to some ck, angular patches included in the white minerals of the main 'vein'. Some he inclusions are 1 cm. in length. The mineral is opaque, streak dark-brown,

strongly ferromagnetic, hardness <6. Material separated with a bar mag contains much manganese and less iron. The powder photograph of this mat taken with iron radiation was indexed as a cubic pattern with unit-cell *a* 8·51Å. None of the lines shows any departure from a cubic lattice, and pattern is definitely of the spinel type and distinct from that of hausman The unit-cell dimension of artificial $MnFe_2O_4$ was found by Holgersson[1] t 8·57Å., a value not greatly in excess of ours for the Benallt mineral. More Mason gives eight measurements of the jacobsite phase in vredenburgites Sweden and India, ranging from 8·48 to 8·50Å. Since our photograph does reveal lines of the hausmannite phase we can with some certainty compare specimen with that from Långban, Sweden, which he describes[2] as contai 55·9 % Mn_3O_4. It is of interest in the absence of a chemical analysis not on compare the X-ray data, but also to comment on Mason's measuremen magnetic susceptibility on artificial preparations of Fe_3O_4 and Mn_3O_4. He fo that susceptibility increases with increase in Fe_3O_4 and that 'the degree of fe magnetism just begins to decrease rapidly below a content of 40 % Fe_3O_4'.

Jacobsite has not previously been recorded from the British Isles. Its prese with the tephroite and alleghanyite may give an indication of the condit under which these minerals have been formed from the original manganese o

Biotite.—A dark-brown mica occurs in the specimens from no. 1 ore-bo The crystals are very small (0·2 mm.). In thin sections they are seen borde and partly enclosing crystals of tephroite and alleghanyite and also as a bor to some of the patches of black magnetic 'ore' (jacobsite). The optical prope are: biaxial, negative, 2E approx. 16°; pleochroism not strong, α orange-ruf $\beta = \gamma$ burnt Siena (Ridgway), absorption $\alpha < \beta = \gamma$; refractive indices β an 1·664±0·002. The refractive index was measured approximately by the Bec line method. The value obtained indicates a biotite high in ferric iron and would expect a certain content of manganese oxides. The refractive index fo and γ is higher than for recorded manganophyllites and the absorption is norm for biotite, whereas for most manganophyllites the absorption is recorded $\alpha > \beta = \gamma$. However, Dana, quoting Hamberg, notes that in some manganoph lites which contain most manganese the absorption is that normal for biot namely, α red-brown, β and γ dark brown, so that the optical properties record may be consistent with a high manganese content.

The ore adjoining the tephroite veins in the specimens from no. 2 ore-bo contains a paler brown mica, appearing as flakes and as radiating sheaves flakes seen on edge. The absorption is $\alpha > \beta = \gamma$, the pleochroism being α amb brown, $\beta = \gamma$ light orange-yellow. This second mica resembles in this particu the manganophyllites from Långban described by J. Jakob.[3]

Tephroite and Alleghanyite.—The blade-like crystals already referred to a conspicuous constituent of the specimens from no. 1 ore-body consist of t minerals, one olive-green in colour, the other clove-brown. Both minerals fo individual crystals and material for their separate examination could be pick out under a hand-lens, but for the most part they are either in parallel sup position or form composite crystals. Often plates of the brown mineral lie paral

[1] S. Holgersson, Lunds Univ. Årsskrift, 1927, vol. 23, no. 9.
[2] B. Mason, Geol. För. Förh. Stockholm, 1943, vol. 65, p. 152. [M.A. 9–32.]
[3] J. Jakob, Zeits. Krist., 1925, vol. 61, p. 158.

he tabular face of the olive-green one, while cross-sections under the microscope w brown crystals with pale-green terminations, or, on the other hand, green blades crossed at right angles by lamellae of the clove-brown mineral. he olive-green mineral is tephroite. In thin crystals it is transparent, pale e-green in colour, and feebly pleochroic with absorption $\alpha > \beta$. Refractive ces $\alpha < 1{\cdot}778$, β and $\gamma > 1{\cdot}778 < 1{\cdot}84$. Measurements of birefringence made on a crystal of nearly uniform thickness and by universal stage methods on a thin ion gave $\beta - \alpha$ 0·026, $\gamma - \beta$ 0·014 $\pm$ 0·001. The optic axial angle estimated from surements on rather awkwardly placed sections gave two values for 2V, 60° and too far apart to be of more than qualitative value.[1] The optic sign is negative. s regards crystal habit the long edges of the blade-like crystals, seen in thin ion, are parallel to the *c*-axis, and the tabular face is (100) and is deeply ited owing to oscillatory combinations of faces of the prism zone.

ptical properties and a qualitative chemical analysis indicated that the mineral tephroite, and Dr. Brian Mason confirmed this identification by means of X-ray powder photograph which proved to be identical with the standard one ephroite from Pajsberg, Sweden. Rotation photographs of a single crystal of Benallt mineral yielded the unit-cell dimensions *a* 4·90, *b* 10·60, *c* 6·25 $\pm$ 0·02 Å. axial ratios calculated from these measurements are $a : b : c = 0{\cdot}462 : 1 : 0{\cdot}590$, eeing closely with those for tephroite given by Hj. Sjögren (1883). Rotation oscillation photographs were indexed and the space-group found to be = *Pnma*, the same as that of olivine with which tephroite is isostructural. he clove-brown, blade-like crystals closely associated with the tephroite are tified as alleghanyite, though they differ from the mineral of the type locality olour and in containing a considerable content of titanium. The identification his mineral is due to Dr. Brian Mason. The qualitative chemical analysis wed it to be a titaniferous silicate of manganese. No titanium-rich manganese ate was known, but the X-ray powder photograph was recognized by Dr. on as identical with that published by C. S. Ross and P. F. Kerr[2] in 1932 for new mineral alleghanyite from Bald Knob, Alleghany County, North Carolina. s identification is confirmed by the optical properties and later chemical lyses and X-ray photographs. The alleghanyite from Bald Knob occurs as ht pink grains in calcite and contains only 0·15 % TiO_2 according to the latest lysis. Our material is clove-brown in colour, translucent only in very thin es or sections, and has a vitreous to resinous lustre. Thin sections show twin-ellae at right angles to the length of the blade-like crystals, and thin plates he mineral, in parallel growth with tephroite, show oblique extinction often metrically inclined in adjacent plates to the edge of the plates (fig. 2A). Sym-rical extinction-angles from the trace of this edge to α' range from 19° to 26°. surements on the universal stage confirm this lamellar twinning and also w that in the intergrowth with tephroite the γ vibration-directions for the minerals are coincident, and that the α direction for alleghanyite is inclined 8° to α for tephroite and that in the lamellar twins the inclination is sym-rical. Ross and Kerr had observed symmetrical extinctions of 22°, and A. F.

[1] The value calculated from the measurements of $\beta - \alpha$ and $\gamma - \beta$ given above is 71°. ct measurement of the optic axial angle in methylene iodide gave $2H_O$ 116°; assuming 79, this leads to 2V 69°.

[2] C. S. Ross and P. F. Kerr, Amer. Min., 1932, vol. 17, pp. 1–18. [M.A. 5–50.]

Rogers found a maximum of 35°. Yosimura on material from Kaso mine, Tos prefecture, Japan, records 27° (and 2V 75°).[1]

A. F. Rogers[2] concluded that alleghanyite from Bald Knob is monoclinic $\beta = 90°$ and the plane of lamellar twinning (001). Following this setting optical orientation of our mineral is $\gamma = b$, plane of optic axis $\perp(010)$, $a : \alpha =$ Pleochroism: β amber-brown, α Dresden brown; absorption $\beta < \alpha$. Approxi determinations of the optic axial angle and birefringence by universal st methods gave 2V 72° to 86°, negative, $\beta - \alpha$ 0·018, $\gamma - \beta$ 0·014 ± 0·001. Refra indices >1·778 <1·84. The specific gravity of analysed material (correcte

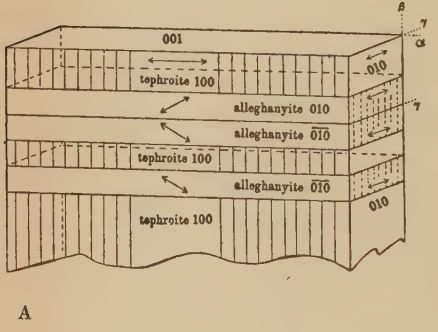


FIG. 2A

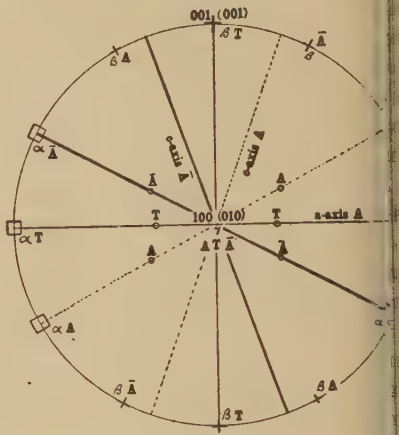


FIG. 2B

FIG. 2A. Parallel intergrowth of tephroite and alleghanyite, the latter showing twin-lamel Vertical striations on (100) of tephroite. Optical extinction-directions indicated by arro

FIG. 2B. Stereographic projection of the same on the (100) face of tephroite, showing opt orientation and optic axes of tephroite (T) and of twinned individuals of alleghanyite (A Ā). The faces (010) and (001) of alleghanyite are enclosed in parentheses.

included banalsite) is 4·088 ± 0·02. Hardness less than 5. Fuses quietly at 2½ black enamel. Decomposed by HCl (1 : 1) readily, leaving a silica skeleton. Th characters agree with those of alleghanyite from Bald Knob, except that the fractive indices are definitely higher and $\gamma - \alpha$ slightly lower.

With regard to the orientation of the parallel growths in tephroite, γ directi for the two minerals being coincident the (010) face of alleghanyite is paralle (100) of tephroite, and the twin-lamellae lie parallel to (001) of tephroite. Th are no crystal faces to enable the position of the *a*- and *c*-axes of the alleghany to be fixed.[3]

Taylor and West[4] investigated the crystal-structure of the chondrodite ser

[1] T. Yosimura, Journ. Fac. Sci. Hokkaido Univ., Ser. 4, 1939, vol. 4, p. 441. [M.A. 7–4

[2] A. F. Rogers, Amer. Min., 1935, vol. 20, pp. 25–35. [M.A. 6–144.]

[3] Ross and Kerr have remarked that a mineral reported as tephroite by A. F. Rogers 1919 from San José, California, has characters similar to those of alleghanyite, and it is teresting to note that Rogers not only records polysynthetic twinning but adds 'in some ar the twinning resembles an intergrowth of two minerals'. Ross and Kerr, loc. cit., p. 13.

[4] W. H. Taylor and J. West, Proc. Roy. Soc. London, Ser. A, 1928, vol. 117, pp. 517–5 [M.A. 3–528.]

showed that the chondrodite structure consists of alternate layers parallel he *c*-face (001) of Mg_2SiO_4 and $Mg(OH)_2$ in the proportion 2 : 1 represented by chemical formula $2Mg_2SiO_4.Mg(OH)_2$. The Mg_2SiO_4 portions possess the ine structure. These authors showed that to make the chondrodite series ıparable with olivine it was necessary to make the crystallographic *b*-axis hondrodite the *a*-axis of the unit cell.

f then Rogers's suggestion that alleghanyite bears to tephroite the same rela- as chondrodite does to forsterite is correct, one may expect to find between structures of the former pair a relation similar to that between chondrodite olivine. The parallel growths of tephroite and alleghanyite are in exact agree- ıt with such a relation, for the layers of alleghanyite in tephroite are arranged allel to the (001) face of tephroite and the (010) face of alleghanyite is parallel he (100) face of tephroite, that is the crystallographic *b*-axis of alleghanyite is allel to the crystallographic *a*-axis of tephroite exactly as Taylor and West's ıcture requires.

.. F. Rogers showed that alleghanyite is the manganese analogue of chondro- with the formula $2Mn_2SiO_4.Mn(OH,F)_2$ and suggested that 'tephroite bears same relation to alleghanyite that forsterite does to chondrodite'.[1] The allel growth of the alleghanyite and tephroite in the Benallt specimen is of ticular interest in the light of this suggestion.

Rogers based his conclusions on the relationship of alleghanyite to the humite ily upon powder data and chemical analyses. It has been possible to isolate gle crystal fragments of alleghanyite from Benallt which give Laue and rota- ı photographs yielding the unit-cell dimensions *a* 4·86, *b* 10·46, *c* 8·3Å.,)° 52′±10′, and the axial ratios $a : b : c = 0{\cdot}465 : 1 : 0{\cdot}794$. The cell edges are htly larger than the corresponding values for chondrodite *a* 4·733, *b* 10·27, 37Å., β 70° 58′, because the divalent manganese ion has a radius of 0·91Å. com- ed with 0·78Å. for magnesium. Hence both the observations on the parallel wth of alleghanyite to tephroite and the unit-cell dimensions of the former eral confirm unmistakably Rogers's work on Bald Knob material. Alleghanyite he manganese analogue of chondrodite.

Microchemical analyses were made on carefully selected fragments of tephroite alleghanyite. Fragments were hand-picked under the microscope and the lysed alleghanyite was believed to be substantially free from tephroite. The ergrowth of the two minerals on a microscopic scale, however, makes an abso- ely clean separation impossible. The results of the analysis of tephroite ble IV, column I) show 0·41 % TiO_2, suggesting an admixture of 8·5 % alle- nyite. In column II are given the analytical results for alleghanyite. This ws 0·51 % Al_2O_3 and 1·12 % BaO. The Al_2O_3 found corresponds to 1·75 % of alsite which would account for 0·40 % BaO, leaving 0·72 % BaO unaccounted

Deducting 1·75 % banalsite from the results in column II gives the composi- n of the alleghanyite in column III, and deducting 8·5 % of alleghanyite[2] of composition from the analysis in column I gives the composition of tephroite olumn IV, and these figures are recalculated to total 100 in column V.

[1] A. F. Rogers, loc. cit., p. 31.

[2] In making these adjustments and in calculating the repeats from the results, an nown though possibly small factor is the proportion of tephroite intergrown with the ghanyite and inseparable from it, for this cannot be detected by the chemical analysis.

Calculating from the result in column V and using the cell sides and spec gravity recorded above gives for tephroite the repeat (table V, column I) and atomic ratio to sixteen oxygen in column II. There is a small silica deficie below that required for the formula $(Mn,Fe,Ca,Mg)_2SiO_4$ which would not h been made up even if the small percentage of Ti were counted with the Si.

On calculating the empirical unit-cell contents of the alleghanyite from col III, table IV and the known cell sides and corrected density the (O,OH) cont comes to 20·51±0·50 (table V, column III). This is clearly an approach t integral value of 20 and the empirical repeat is reduced to that basis in column

As in the repeat of tephroite, there is again a deficiency in the amount of required by the formula. However, in this case it is possible that part of th present is replacing Si, the main part replacing Mn with a balancing replacem of OH by O. The repeat may then be written $4Mn_2(Si,Ti)O_4.2(Mn,Ti)(O,OH)_2$.

Considering the small amount of material available and the difficulty of obt ing its complete separation from banalsite and tephroite the result shows a co vincingly close approach to the composition suggested by A. F. Rogers.

We must await further evidence before the exact role of Ti in the alleghany is proved. In the meantime the presence of 4·8% of TiO_2 is not held to nec sitate a new name for this mineral as in every respect other than colour, crys habit, and its content of TiO_2, it agrees in its properties with the alleghanyite Bald Knob.

TABLE IV. Chemical analyses of tephroite and alleghanyite.

	I	II	III	IV	V
	Tephroite.	Alleghanyite.	Alleghanyite.	Tephroite.	Tephroiti
SiO_2	28·90	23·48	22·86	26·94	29·27
TiO_2	0·41	4·81	4·81	—	—
Al_2O_3	nil	0·51	—	—	—
MnO	65·71	66·15	66·15	60·03	65·23
FeO	1·17	0·78	0·78	1·11	1·20
MgO	1·89	0·85	0·82	1·82	1·98
CaO	2·21	0·80	0·77	2·14	2·32
BaO	nil	1·12	0·72	—	—
$(Na,K)_2O$	nil	n.d.	—	—	—
H_2O	n.d.	2·94	2·94	—	—
F	n.d.	nil	—	—	—
	100·29	101·44	99·85	92·04	100·00
D_4^{16}	4·024±0·01	4·07±0·02	4·088±0·02	4·020	—

TABLE V. Number of atoms per unit cell.

	Tephroite		Alleghanyite		
	I.	II.	III.	IV.	
Si	3·84	3·87	3·85	3·75	4·0
Ti	—	—	0·61	0·25	
				0·35	
Mn	7·27	7·32	9·43	9·20	10·04
Fe	0·13	0·13	0·11	0·11	
Mg	0·39	0·39	0·21	0·20	
Ca	0·33	0·33	0·14	0·13	
Ba	—	—	0·05	0·05	
			9·94		
OH	—	—	3·30	3·22	20
O	15·90±0·30	[16]	17·21	16·78	
			20·51 ±0·50		

The order of formation of the minerals in the banalsite-bearing 'veins' was parently: alleghanyite and tephroite, jacobsite, biotite, banalsite, baryte, cite, and finally zeolites filling interstices and later veinlets.

In conclusion, we wish to express our thanks to Dr. Brian Mason (now of the w Zealand Government Department of Scientific and Industrial Research) for e initial X-ray work identifying the tephroite and alleghanyite, to Mr. C. M. chardson, the former manager of the mine, and to Mr. William Campbell, the esent manager, for having watched for and found the specimens of the new neral. Special thanks are due to Dr. A. W. Groves for having sent the material us for study and for his continued and unfailing interest in the work.

A brief description of the manganese ore-bodies.

By A. W. Groves, D.Sc., Ph.D., M.I.M.M., F.G.S.

The Ordovician manganese ore of the Rhiw district of the Lleyn Peninsula, rnarvonshire, has been won from a number of mines arranged in two groups parated by a mile of country in which no workable ore has been found. The uthern group consists of the Nant mine and several small trials in the Nant y dwen. The northern group, in which the present discovery was made, consists a number of old mines stretching for 2200 feet southwards from the old open-st 1000 feet SW. of the prominent Clip y Gylfinhir to Tyddyn Meirion on the iiw-Aberdaron road. In addition to the opencast, one (partly opencast) in-ned shaft, and a gloryhole at Tyddyn Meirion, the deposits have been worked along this 2200 feet from ten principal shafts sunk to depths ranging from 40 100 feet.

The geology of the district has been described by Dr. C. A. Matley[1] and the trography of the ores by Dr. A. W. Woodland,[2] both valuable papers, but, as e mine workings were then inaccessible, and few plans had been deposited with e Mines Dept., these workers could not be expected to throw appreciable light the geology of the mines themselves, beyond the earlier brief statement in a ological Survey publication,[3] parts of which have proved to be inaccurate.

The manganese in the undecomposed ore has been described[3] as being 'in the rm of carbonate, with a small proportion of silicate'. Dr. Woodland's paper es not include a description of Benallt ore, as the only ore lying about at that ne was at Nant. However, his petrographic descriptions of Nant ore indicate at the bulk of the manganese is present as rhodochrosite, with some quite bsidiary psilomelane, and an insignificant amount as manganiferous chlorite. either of these mineralogical descriptions fits fresh Benallt ore, of which a typi-l bulk (bunker) analysis contained (dry): MnO 38·72, MnO_2 5·52, Fe_2O_3 9·52, O_2 21·30, Al_2O_3 6·25, CaO 4·64, MgO 1·24, $H_2O(+110°C.)$ 4·40, CO_2 4·60, P_2O_5 332, SO_3 0·083, K_2O 0·44, Na_2O 0·55, BaO 1·86, $BaSO_4$ 0·52, As trace, CuO 0·005, iO 0·020, CoO nil, ZnO nil, total 100. (Analyst, G. Watson Gray, Liverpool.) eglecting MnO_2 in this analysis, there is sufficient CO_2 to satisfy less than one-th of the MnO to form rhodochrosite. Actually, the amount of available CO_2 is

[1] C. A. Matley, Quart. Journ. Geol. Soc. London, 1932, vol. 88, pp. 245, 246, 248, 249, 263.
[2] A. W. Woodland, Proc. Geol. Assoc. London, 1939, vol. 50, pp. 205–222. [M.A. 8–250.]
[3] Tungsten and manganese ores. Mem. Geol. Surv., Special Reports on the Mineral Resources of Great Britain, 3rd edit., 1923, p. 71.

somewhat less than this, for calcite veins are often seen, and a small amount CO_2 is probably combined with the collophane that occurs in nearly all the

A thin section of the spotted manganese ore attached to the specimens fo in no. 1 ore-body shows the largest and palest nodules in the ore attached to specimen to consist of collophane; other and smaller pale patches consis felspar and epidote, either separately, or as mixtures of both. The whole of groundmass is heavily impregnated with opaque ore material in which only s minute veins of reddish-brown manganiferous chlorite and detrital grains of spar largely replaced by chlorite and epidote are to be seen. The collop nodules are quite unaffected by the metasomatism, which has converted ne all the rest of the material into ore.

As the modern mine developed, Benallt was found to have perhaps the complex structural geology of any British metalliferous mine now operating brief, the ore occurs in lenticles of all sizes from 10 or 20 tons up to 30,000 t The ore lenticles, enclosed in mudstone, run for the most part in a disconne manner parallel to and along the very centre of a belt of strata contained betw the foot-wall sill (an albitic dolerite) and the lower Clip lava [of Clip y Gylfinh They are usually elongated N–S., dip at angles of about 60° to the E. (but t dips tend to flatten out towards the upper and lower terminations), and m occur en echelon or one behind the other. The structure generally within mudstone is imbricate and there are innumerable thrusts and faults. The N. S. ends of ore-bodies are often terminated by curving thrust-faults. As our kno ledge of these ore-bodies has grown, certain of the larger ore-bodies have be found to be a complex in themselves containing one or more bands of includ mudstone and clear evidence of overriding within themselves. By means of ov riding, an ore-bed, originally 8–10 feet thick in all probability, has been bu up into a massive lenticle 30 feet thick measured horizontally in the dip directio and having anything from 30 to 60 feet inclined height. It is when ore overri ore that mineralized veins are usually observed cementing the ore together aga

The mineral association described in the foregoing paper suggests a certa degree of metasomatism at an elevated temperature, subsequent to the formati of the ore by metasomatism of a bedded deposit and subsequent also to the form tion of lenticular ore-bodies therefrom. The source of this latest metasomati is not evident, though the foot-wall sill of albitic dolerite, believed to be of co siderable thickness, may well have been intruded along a major thrust-pla towards the close of the period of imbrication and so metamorphosed the new formed ore-bodies, particularly along fractures where late readjustment w taking place. The fact that so far the minerals have all tended to be located the foot-wall side of the ore-bodies, i.e. on the side towards the sill and dista only 100 feet or so from it, lends some support to this tentative explanation.

Explanation of Plate IV.

FIG. 1. Photomicrograph of thin section showing banalsite (with some calcite at the t right-hand corner), and intercrossing blades of alleghanyite (dark); light patches in t alleghanyite are tephroite. Magnification ×6. (Photo. W. H. T. Tams.)

FIG. 2. Laue photograph of a banalsite cleavage prism along the *c*-axis with *a*-axis horizont Tungsten radiation. Plate to crystal 3·5 cm. (Photo. F. A. Bannister.)

Notes on the cleaving and sawing of diamond.

By Paul Grodzinski, A.M.I.Mech.E.

[Read March 23, 1944.]

' seems to be a peculiarity in the history of the diamond that from time to time operations which have been known from time immemorial are re-invented claimed to be new. For instance, cleaving, which is said to have been known ie Indians, was discovered again by W. H. Wollaston. It is obvious, too, that ving was already known to A. B. de Boodt in 1604. The same applies to the ng of gems by a thin rotating disk, which seems to be as old as the engraver's dle lathe (earliest reference about 1520); but this art does not seem to have applied to diamonds, as the first reference to diamond sawing with a thin ting blade is that in 1871. All previous references seem to be to the sawing iamonds with a thin wire moistened with a paste of diamond dust and oil, otherwise designated as the Chinese method. Other gemstones were always n with thin disks on lapidaries' benches with vertical spindle. Similar remarks be applied to bruting and drilling, but only polishing seems to have always recognized as the main operation.

he octahedral cleavage is the one used in practice, but J. R. Sutton[1] also rs to dodecahedral and cubic cleavages of the diamond. I have to admit, ever, that I have never yet convinced a cleaver to cleave in these directions. he cleavage of diamonds not only represents a more or less easy means for ding stones and removing external matter, it is also a dangerous property use in many industrial applications it is necessary to avoid the possibility of vages, as far as possible. The great technical difficulty is that this cannot be ays altogether avoided, so that a compromise is necessary. Sometimes com- ents which have already undergone considerable stress and strain in previous hining operations, for instance bruting, are shattered when they are dipped a fluid, e.g. ether; such phenomena need further elucidation.

here are other instances where the cleavage is usefully employed. The edges left pieces represent the so-called dodecahedral or two-point grain, and for this on are considered to be very resistant, in the direction from one point to the er, but not so resistant, i.e. soft, in the direction perpendicular to the former. s may be explained by mentioning some applications. The glass-cutter nond is used in such a way that it cuts with its slightly curved edge. The rp' with which diamonds are grooved preparatory to cleaving is usually a piece, and with the sharp edge of an angle of approximately 70° the groove bbed in the diamond, just in the same orientation. Another good example is diamond used in a special brand of dental tools. They use crystals split along lines of cleavage so that the edges exposed are able to scratch as sharply as ible. The abrasive action of diamond-impregnated tools, and in diamond dust arser mesh size, can be explained in a similar way, but the grains are generally orientated. On the other hand, it can be said with some degree of certainty the great abrasive action of diamond powder is due to the large amount of vage planes.

[1] J. R. Sutton, The diamond, a descriptive treatise. London, 1928, pp. 16–17. [M.A. 4–6.]

Some octahedral stones were recently sawn in the two possible sawing di tions, namely, parallel to cube and dodecahedral faces, and the shapes obtained led to some consideration on the geometrical aspects of the probl In sawing diamond a surface roughness of generally about 15 micro-inc obtained, and the optical interference method[2] proved to be useful for exam tion of the surface. Whereas in cutting wood, glass, and quartz the material sawn is fed through the sawing blade, in diamond cutting, and usually also sapphire, the work is moved radially into the wheel.[3] Recently a hydraulic de was suggested as shock absorber for the stem attached to the work-ho permitting adjustment.[4]

The sawing blades are of a special phosphor-bronze and the thickness is ada to the size of the stone, being 0·002 inch for small stones and ranging u 0·005 inch for larger stones. Usually the blade is trued in the machine by u a knife or a broken piece of a file, and is further trued from the side by t wooden sticks covered with emery cloth.

Recently also, diamond-impregnated blades have been tried out for the sa of diamond. The thickness of such a blade is at present about 0·0035 inch, is, seven times as thick as a phosphor-bronze blade. These blades, produce Impregnated Diamond Products, Gloucester, are not so much interesting f an economical point, but they allow cross-grained stones to be sawn w hitherto could not be sawn at all.

Recently I was fortunate enough to obtain some actual records of saw operations performed by a firm specializing in this trade. This firm has sa 23,426 stones weighing 16,387 carats during a period of twelve months on ab 24 to 44 machines, with the loss of only 558 carats, the average loss, therefo being only 3·41 %. Details referring to a number of 2886 stones (out of the to production) are given in fig. 1. From this it can be seen that it is possible foretell the diamond loss of a particular stone between the limits of ± 1 %. T loss with larger stones is very small. That the data collected are really represen tive can be seen from the fact that the average is 3·38 %, compared with 3·41 for the whole bulk. The determination of the weights was made to a commerc degree of accuracy, that is to say the second decimal point was estimated. F the total production of 16,387 carats, 1344·5 carats of crushing boart, mai Brazilian, were consumed, or 8·2 % by weight. But since the weight lost is 3·40 the total amount of diamond consumed in the process is about 12 %. For co mercial considerations it can be said that with 1 carat of boart 12·2 carats diamond can be sawn. This factor is interesting because in conjunction w others it gives an indication of the efficiency of production. When the works question were started it was 12·5 % and at the present time it has been redu to 12·15 %.

It would, of course, be of interest to obtain similar data from other fir engaged in sawing diamonds. In such data numerous factors enter, such as t

[1] P. Grodzinski, Diamond geometry. Industrial Diamond Review, 1944, vol. 4, pp. 49–5

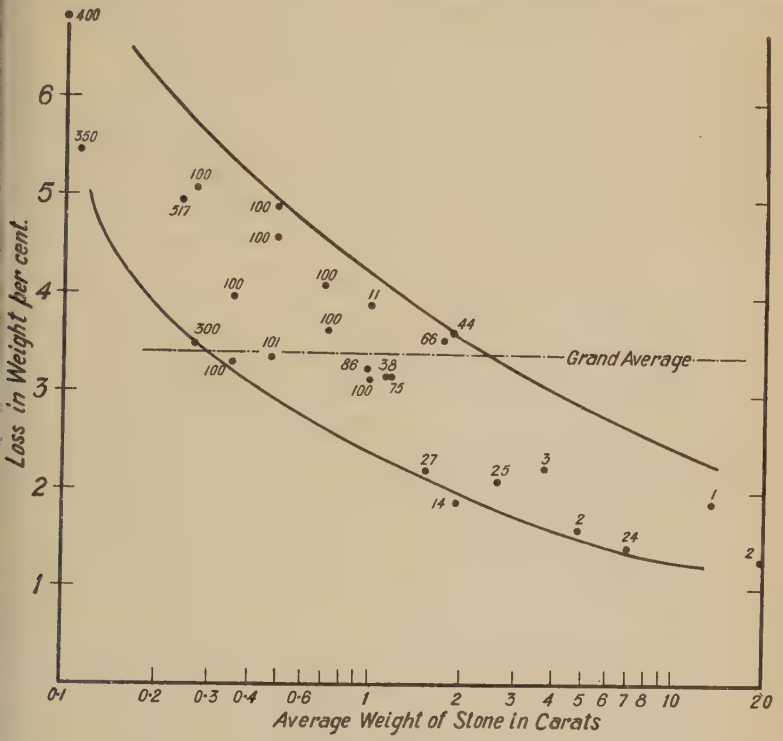
[2] J. F. Kayser, The micro-topography of diamond . . . Industrial Diamond Review, 194 vol. 4, pp. 2–4, 72–75. Fig. 4, p. 73, shows the interference fringes on a sawn surface of d mond. [M.A. 9–49.]

[3] New quartz sawing machine. Industrial Diamond Review, 1944, vol. 4, pp. 63–64.

[4] P. Grodzinski, Provisional Patent Application, 21704, 1943.

l of the operator, the condition of machines, and so on. Such information, ever, is not usually very readily available.

awing time.—Very important from a production point of view is the time essary for sawing an individual stone. Also in this case the data given in the ature are not very concise, and of course they vary according to the size of stone, the sawn area (not usually taken into account), the condition of machine l, the preparation of the sawing blade, and the skill of the operator. I obtained



IG. 1. Loss in weight during sawing of diamond, based on records from 2886 stones. (The numbers against the plotted points give the number of stones in each batch.)

firmation that an expert diamond sawer can saw a 1-carat stone in $2\frac{1}{4}$ hours; ourse the man can operate about 11 to 16 machines. Another record states a young boy (trainee) sawed 140 stones of $\frac{1}{4}$ carat each during a shift of 9 rs on 11 machines; thus the sawing of one stone was approximately $(9 \times 11) \div$ = 42 minutes, not taking into account any idle time for resetting. The set- and taking-off time for each stone in such instances would be one to two utes. Since the cross-sectional area of the small stone is about 0·4 that of the er stone the sawing time of the small stone should have been 0·9 hour. This erence shows that there is no visible correlation between these two data, and ourse the technical analysis of the sawing operation is not an easy one, as the s-sectional area varies during the cut, and as the load is constant the specific ng pressure varies from a maximum to a minimum, and is then increasing

again, assuming that the stone exhibits always the same resistance against ting, which as a matter of fact it does not. The data indicate that diamon be sawn at a rate of 10 to 15 sq. mm. per hour, the length of cutting su necessary to perform this work being about 60 miles per hour.

It may be of interest to compare these data with sawing results obtained other materials (table I). Of course, these data were obtained with anothe of machine and with another diamond grade, and are therefore not strictly parable, but all tests are representative for the best commercial practice.

TABLE I. Results of sawing of various hard materials.

	Cross-sectional area in sq. mm. sawn per min.	Sawing time in min. for one sq. mm.	Ratio of resistance to sawing	
			Corundum = 1.	Diamond =
Diamond	0·166–0·200	6–5	310–260	1
Sintered carbide	13–28·5	0·0765–0·035	40–18	0·15–0·0
Natural sapphire (Australia)	168	0·00595	3·1	0·011
Natural sapphire (Ceylon)	450	0·00222	1·16	0·004
Synthetic corundum (white)	520	0·00192	1	0·0035

The comparison shows that it takes nearly the 100 to 300 fold time to saw thro diamond than through sapphire, the material which is next to diamond on Mohs's scale of hardness.

For gem cutting there is a special arrangement for sawing one diamond a larger and smaller part, thus obtaining a larger and more valuable stone bes the smaller one.[1] The general practice of to-day, however, seems to be to div a stone into two parts of equal size by sawing just through the biggest cr section of the stone. A good practice is to start the sawing cut with a thic blade and then to continue the operation with the thinnest possible blade— method obviates rubbing of the side faces. The power consumption per mach is estimated to be about 1/16 horse-power.

Acknowledgements are due to the Diamond Trading Company for the loan stones, Mr. J. F. Kayser for the loan of photographs and slides, Mr. Ryba Sapin Works for very useful information and the loan of a cleavers' back an sawing machine, Mr. J. Jacobs of Messrs. Ber and Lehrer for details on cleavi Drs. W. A. and N. Wooster for X-ray investigations and models, Messrs. Impr nated Diamond Products, Gloucester, for the loan of a diamond sawing blade a stone.

[1] P. Grodzinski, Diamond and gem stone industrial production. London, 1942. [M 8–266.]

MINERALOGICAL ABSTRACTS

(Vol. 9, No. 3, September, 1944.)

New Minerals

IGER (J. v.) & BAYRAMGIL (O.). *Yenerit, ein neues Blei-Antimon-Sulfosalz aus Işikdağ (Türkei).* Schweiz. Min. Petr. Mitt., 1943, vol. 23, p. 616.

'his is the most abundant mineral in the ore-deposit of Işikdağ (NNW. Ana). It is massive or as fine needles; grey-black, black streak, sectile, H. 2–2½, gr. 6·05, strongly anisotropic and distinctly pleochroic, no cleavage, lamellar ining. X-ray rotation photographs give a spacing 8·05±0·05Å. parallel to the dle axis; powder photographs are very similar to, but distinct from, those of langerite and falkmanite [M.A. 7–468, 513]. Analysis, S 17·06, Pb 57·32, 23·60, As 1·83, Cu, Fe traces = 99·81, gives a formula $11PbS.4Sb_2S_3$, rmediate between those of boulangerite ($10PbS.4Sb_2S_3$) and falkmanite $PbS.4Sb_2S_3$). L. J. S.

AMLING-MENDE (Ilse) & LEOPOLD (Gustav). *„Jusit", ein vermutlich neues Mineral!* Neues Jahrb. Min. Monatshefte, Abt. A, 1943, pp. 178–184, 2 figs.

. white radially fibrous mineral fills amygdaloidal cavities in a dike of melilitite Jus in the Schwäbische Alb, Württemberg. The fine needles give straight nction with positive elongation and are probably orthorhombic; n (⊥ fibre) 58, low birefringence, sp. gr. 2·32. Mean of two analyses: SiO_2 40·38, Al_2O_3 8·23,) 35·12, Na_2O 1·14, K_2O 2·47, H_2O+CO_2 12·80, total 100·14; formula '$(Si,Al)_6$,Na,K)$_5$.5H_2O'; 8·31% H_2O is lost up to 230° and the remainder more slowly to red-heat. X-ray rotation photographs give a spacing along the needle axis ·69Å. (i.e. about half that for pectolite, but there is no other similarity). The eral also differs from thaumasite, ptilolite, inesite, riversideite, radiophyllite, sporite, and the zeolites. L. J. S.

NOFF (G.). *A titano-thucholite from the Boliden mine.* Geol. För. Förh. Stockholm, 1943, vol. 65, pp. 31–36, 1 fig.

. jet-black radioactive bituminous mineral, H. about 3, sp. gr. 1·512, occurs rregular nodules up to 6·5×3·0×2·0 cm. in quartz-bearing andalusite-rock, cite streaks, and quartz veins at Boliden, Sweden [M.A. 8–311]. Extremes of chemical and X-ray spectrographic analyses by R. Blix are: U 5·35–6·40, 0·62–1·1, Pb 0·44–0·48, ash 15·3–19·0. Another determination yields SiO_2 1·9, $_2$ 4·5, Al_2O_3 1·6, Fe_2O_3 0·4. Combustion analysis of the dried mineral gives 5·17, 67·90, H 2·11, 2·65, ash 23·7, 23·3%. C. F. D.

SON (Brian). *Alpha-vredenburgite.* Geol. För. Förh. Stockholm, 1943, vol. 65, pp. 263–270, 2 figs.

redenburgite, $(Mn,Fe)_3O_4$, as previously known, consists of an oriented intergwth of jacobsite and hausmannite [M.A. 7–169], corresponding to the two-se region (Mn_3O_4 54–91% below 800° C.) in the system Fe_3O_4–Mn_3O_4. This stinguished as β-vredenburgite. Specimens of this composition from Långban

Sweden, were, however, found to be homogeneous, representing a metastal α-vredenburgite. This occurs with bixbyite and braunite in manganophyllite, is pseudomorphous after bixbyite, $(Mn,Fe)_2O_3$, due to some reduction proc It is tetragonal with the hausmannite structure and cell dimensions ranging f *a* 8·25, *c* 9·09 Å. (*c*/*a* 1·102) to *a* 8·38, *c* 8·81 (*c*/*a* 1·051), approaching cubic s metry with increase in iron. It is anisotropic, pleochroic, and feebly magne Analysis by G. K. Almström of material containing small amounts of manga phyllite and calcite gave Fe_2O_3 33·14, MnO 56·53, SiO_2 0·57, TiO_2 2·01, Al_2O_3 1 MgO 1·29, CaO 0·77, Na_2O 0·24, K_2O 0·10, CO_2 0·69, H_2O 0·87, O 3·15 = '100·1 sp. gr. 4·67, H. about 5. L. J. S.

Merriam (Richard) & Kennard (T. G.). *An unidentified mineral in the qu basalt of Lassen volcanic national park, California.* Amer. Min., 1943, vol. 2 pp. 602–604.

Old fractured surfaces of the lava show a film of blue glass (*n* 1·500–1·525) wh in small spots has crystallized as a blue-green mineral. This appears to be tricl with three good cleavages, α 1·545, β 1·565, γ 1·575, 2V 50–60°, negative, sp. 2·60, H. 3. Spectrum analysis shows much Al and Si with small amounts of C Mg, Fe, Cu, &c., in both the glass and the crystals. L. J. S.

Wasserstein (B.). *On the presence of boron in braunite and manganese o* Econ. Geol., 1943, vol. 38, pp. 389–398.

Spectrographic analyses, supported by a few chemical analyses, show 0·3 1·2% B_2O_3, average about 0·5%, in 40 samples of braunite from the Postmasbu field in South Africa, and from India, Sweden, Germany, and Brazil. Oth manganese ores carry less than 0·1% B_2O_3, except when they contain braunit '*Ferribraunite* is not stressed as a new mineral species . . . but it represen chemically a product intermediate between sitaparite and braunite. . . . The nam [sitaparite] is here retained for minerals intermediate in composition betwe bixbyite and partridgeite' [M.A. **9**–4]. M. A. P.

Barsanov (G. P.) Барсанов (Г. П.). *Ishkulite—a new mineral of the spinel grou* Compt. Rend. (Doklady) Acad. Sci. URSS, 1941, vol. 31, pp. 468–471, 1 fi [M.A. **8**–230.]

[Gerasimovsky (V. I.)] Герасимовский (В.И.). Нордит—новый минерал Лов зерских тундр. Доклады Акад. Наук СССР, 1941, vol. 32, pp. 496–49 1 fig. [M.A. **8**–279.]

X-rays and Crystal-structure

Bragg (*Sir* Lawrence). *The history of X-ray analysis.* Science in Britain, Londo (British Council; Longmans Green & Co.), 1943, ii+25 pp., 4 pls., 4 text-fig Price 1*s.*

This is very modern history—all since 1912. It gives a concise account of th rapid development and important results that have been achieved with the ne and powerful X-ray method for the examination of crystals. Personal detai explaining how difficulties were overcome in the early stages add much to th interest of this small pamphlet. L. J. S.

AGG (*Sir* Lawrence). *Lightning calculations with light.* Nature, London, 1944, vol. 154, pp. 69–72, 6 figs.

A description of optical devices for assisting in the determination of crystal-uctures. The 'fly's eye' method recently improved by C. W. Bunn is explained detail. A given section of a known crystal-structure drawn to scale is projected rough a 'fly's eye' (a square pattern of minute transparent holes spaced 40 to e cm. in an opaque background) to produce a cross grating. This cross grating ll possess the pattern of the crystal-structure viewed in the given direction and ll diffract monochromatic light to produce spectra which should have the same ative intensities as the corresponding X-ray spectra. This method could be ed for deciding between a number of alternative structures quite rapidly. thods of constructing 'Patterson' or 'vector' diagrams, given the crystal-ucture, permit direct comparison with X-ray measurements of structure factors d eliminate much tedious calculation. F. A. B.

ERRMANN (K.). *Strukturbericht, Band VII, 1939.* Zeits. Krist., 1943, Ergänzungsband 7, vii+306 pp., 93 figs. [M.A. **5**–5, **6**–404, **7**–79].

This volume for the year 1939 is about equally divided between new organic d inorganic crystal-structures and includes new structures of only a few nerals—tellurite, carnallite, &c. As usual the volume includes abstracts of all ray diffraction studies. F. A. B.

PSON (H.), PARKER (A. M. B.), & STOKES (A. R.). *Summarized proceedings of conference on X-ray analysis—Oxford, 1944.* Journ. Sci. Instr., 1944, vol. 21, pp. 113–118, 7 figs.

A summary of papers read in three sessions: (1) The analysis of complex organic npounds, mainly a discussion on the use of Fourier synthesis for crystal-ucture determination. (2) Fibres and other types of imperfect structure, a nsideration of materials that do not in general give good X-ray photographs. Preferred orientation in sheets and wires. F. A. B.

PSON (H.) & RILEY (D. P.). *Absolute X-ray wave-lengths.* Nature, London, 1943, vol. 151, pp. 250–251.

A revised value of Avogadro's number $6{\cdot}0228 \times 10^{23}$ mole^{-1} has been derived m the observed specific gravity and unit-cell dimensions of calcite using X-ray ve-lengths measured by diffraction from a ruled grating. Lattice spacings sed on Siegbahn's X-units are as a consequence 0·2% low. The authors suggest at the new X-ray wave-lengths in Ångström units be adopted. F. A. B.

NFELT (H.). *Setting of crystals for single crystal X-ray photographs.* Arkiv Kemi, Min. Geol. Stockholm, 1939, vol. 13B, no. 9, 7 pp., 3 figs.

When by Laue photographs or otherwise a crystal has been adjusted on the niometer arcs with a zone axis almost coincident with the axis of rotation, the al adjustments can be made by pairs of oscillation photographs. Having chosen oscillation range with one of the goniometer arcs along the direction of the X-ray am a photograph is taken first in this position and then on the same film for a

shorter period with the arc turned through 180°. One half the angular separati of the pairs of nearly coincident spots above and below the equator is applie the appropriate goniometer arc in the sense given by the differently exposed s on the photograph. F. A. B

White (William C.). *A graphical interpretation of X-ray diffraction data u polar co-ordinates.* Amer. Min., 1943, vol. 28, pp. 99–102, 3 figs.

For cubic crystals the Bragg equation $n\lambda = 2d \sin\theta$ may be written sin $n\lambda\sqrt{(h^2+k^2+l^2)}/2a$. A graph on tracing paper with the lattice constants a 1– the quadrant of a circle and $n\lambda\sqrt{(h^2+k^2+l^2)}/2$ as horizontal lines is placed o a radial set of lines giving values of θ from the powder photograph. Coincid of these radii with a constant polar distance gives the value of a. NiO is show an example. L. J. S

Lonsdale (K.). *Crystal photography with divergent X-rays.* Nature, Lond 1943, vol. 151, p. 52, 3 figs.

Reproductions are given of Kossel line photographs of a diamond plate (taken with divergent copper X-radiation. A simple explanation of the observ reflection and deficiency lines is given and how to index the lines. 'One or half-minute photographs of a suitably shaped crystal can, in theory at le supply all the information required to ascertain the unit-cell and space-grou The occurrence of deficiency lines for values of θ near 90° enables lattice spacin to be measured very accurately. F. A. B.

Lonsdale (Kathleen). *Divergent-beam X-ray photography.* Nature, Londo 1944, vol. 153, pp. 22–23, 1 fig.

Divergent-beam photographs of cubic crystals of unknown orientation quick yield the positions of symmetry elements. One point of intersection of the 31 133 $CuK\alpha_1$ conics lies very nearly on the 220 $K\alpha_1$ conic for a divergent-bea photograph of diamond thus permitting an evaluation of the lattice constant fr from the more usual sources of error. This value, corrected for the refracti index of diamond, is $3{\cdot}55974 \pm 0{\cdot}00005$kX, relative to 1·537395kX for $CuK\alpha_1$ vacuo. The range of variation for a number of diamonds is $3{\cdot}55970 \pm 0{\cdot}00020$k at 18° C. Type I, the 'opaque' variety of diamond, yields bad divergence-bea photographs, whereas type II diamond yields good ones. This is in accordan with the evidence already adduced that type II is mosaic, but type I monolith in structure. F. A. B.

Lonsdale (Kathleen). *X-ray divergent-beam photography as a test of crystal pe fection.* Nature, London, 1944, vol. 153, pp. 433–434.

Divergent-beam photographs show that wide variations exist in the cryst perfection of many organic substances. By immersing in liquid air those whi approach perfection and therefore give large primary extinction effects the d vergent-beam photographs are much improved, indicating a breakdown into mosaic. Liquid air cooling does not, however, diminish the crystalline perfecti of diamond type I or of calcite. F. A. B.

RBAIRN (H. W.). *Packing in ionic minerals.* Bull. Geol. Soc. Amer., 1943, vol. 54, pp. 1305–1374, 28 figs.

pproximate quantitative values are given to the ratio ionic volume : unit-cell me (the 'packing index') for some 200 selected mineral species. Correlated sp. gr., hardness, and mean refractive index, this packing index in general lays a sympathetic variation, discrepancies being confined principally to the al data for minerals containing much Ti^{4+}, Zr^{4+}, B^{3+}, Fe^{2+}, and K^{1+}. Ti^{4+} is inant in minerals with unexplained hardness anomalies. Correlation with morphic-inversion phenomena is incomplete and most satisfactory in trans- ations initiated by pressure. Various petrological problems are discussed ne light of packing indices, topics dealt with including the crystallization ence, the origin of eclogites and glaucophane-schists, the development of hyroblasts, stress and anti-stress minerals, and mineral inversions in stony orites. C. F. D.

G (Gunnar). *Some notes on MX_2 layer lattices with close-packed X atoms.* Arkiv Kemi, Min. Geol., 1943, vol. 16B, no. 3, 6 pp.

- KIESSLING (Roland) & LINDÉN (Elsa). *On the crystal structure of cadmium bromide and cadmium iodide.* Ibid., no. 4, 9 pp.

- & LINDÉN (Elsa). *X-ray studies on the system $CdBr_2$–CdI_2.* Ibid., no. 5, 10 pp., 1 fig.

mbols are suggested for the different types of close packing in layer lattices, hich $CdBr_2$ and CdI_2 are examples. [M.A. **3**–182, **5**–468.] L. J. S.

NOFF (G.). *On new crystals to be used in chemical X-ray spectrography.* Arkiv Kemi, Min. Geol., 1943, vol. 16B, 5 pp., 4 figs.

place of curved crystal surfaces, plane faces of calcite $(10\bar{1}1)$ and rock-salt) have been most commonly used, the former giving better lines and the latter onger reflection. Other minerals that have been tried are diamond, blende, tz, muscovite, topaz, and beryl. A still larger dispersion, but lower reflecting er, is given by the scalenohedron face $(21\bar{3}1)$ of calcite with the X-ray period 3Å. (on calcite $(10\bar{1}1)$, d 3·029). Other plane faces suggested are (210) of te and (010) of gypsum. [M.A. **6**–36, **7**–215.] L. J. S.

IE-ROTHERY (William), RAYNOR (Geoffrey Vincent), & LITTLE (Alexander Torrance). *The lattice spacing and crystal structure of cementite.* Journ. Iron and Steel Inst., 1942, vol. 145 (no. 1 for 1942), pp. 143P–149P, 3 figs.

mentite, isolated from steel by electrolytic action, is orthorhombic with 155, b 5·0773, c 6·7265Å. at 25° C., and analysis agrees with Fe_3C. The struc- is derived from the body-centred structure of martensite by a simple shears L. J. S.

CH (N.J.). *The positions of the carbon atoms in martensite.* Journ. Iron and Steel Inst., 1943, vol. 147 (no. 1 for 1943), pp. 221P–231P, 3 figs.

direct evidence suggests that the carbon atoms are at mid-points of the long

edges and at the centre of the end faces of the body-centred tetragonal cell. that they are surrounded octahedrally by iron atoms; but, owing to the defici in carbon, many of the positions are not occupied. L. J.

Ramsdell (Lewis S.). *The crystallography of acanthite, Ag_2S.* Amer. Min., vol. 28, pp. 401–425, 7 figs.

X-ray examination of slender prisms of two types from Porco, Bolivia Himmelsfürst mine, Freiberg, Saxony, gave a monoclinic unit cell, a 9·47, b c 8·28Å., β 56° ($a:b:c = 1{\cdot}368:1:1{\cdot}96$), containing $8Ag_2S$; space-g $C^5_{2h} = B2_1/c$. There is polysynthetic twinning (001) and contact twinning (The monoclinic cell is both pseudo-orthorhombic and pseudo-cubic, and the temperature cubic form of Ag_2S seems to be related to the pseudo-cubic cel ordinary temperatures argentite is a paramorph of acanthite after the temperature cubic form. [M.A. **3**–19, 338.] L. J. E

Buerger (M. J.). *The unit cell and space group of orpiment.* Amer. Min., vol. 27, pp. 301–304, 1 fig.

Equi-inclination Weissenberg photographs about the c-axis only of the distorted portion of a single crystal of orpiment from Mercur, Utah, confirm t the mineral is monoclinic, although goniometric and optical measurements very close to orthorhombic. The unit cell, a 11·47, b 9·57, c 4·24Å., β 89° ($a:b:c = 1{\cdot}195:1:0{\cdot}442$), contains $4As_2S_3$; space-group $C^5_{2h} = P2_1/n$. orientation is the same as that of Mohs (1925), Stephanović (1904), and Pala and Modell [M.A. **4**–479], but with their $a\times 2$, $c\times\frac{2}{3}$. L. J. S

Berry (L. G.). *Studies of mineral sulpho-salts: VII—A systematic arrangem on the basis of cell dimensions.* Univ. Toronto Studies, Geol. Ser., 19 no. 48, pp. 9–30, 1 fig.

A review of the available structural data brings out the frequent recurrence lattice periods near 4, 6, 8, 11, 15, 19Å., and suggests changes in the older sys matic arrangement. The typical crystal habits conform to the Bravais princip Cannizzarite [M.A. **7**–386] is identical with galenobismutite [M.A. **8**–214] a falkmanite [M.A. **7**–513] is indistinguishable from boulangerite [M.A. **8**– [M.A. **8**–363.] M. A. P

Frondel (Clifford). *Paramelaconite: a tetragonal oxide of copper.* Amer. Mi 1941, vol. 26, pp. 657–672, 5 figs.

Paramelaconite (G. A. Koenig, 1891) from Copper Queen mine, Bisbee, Arizo is known only as two specimens. Prismatic crystals (up to 3 cm.) with the for (100), (101), (001), and $a:c = 1:1{\cdot}6709$, are black with a faint tinge of pur and brilliant metallic-adamantine lustre; streak brownish-black, sp. gr. 6· H.4½. Etch-figures show ditetragonal-bipyramidal symmetry. The body-centr cell has dimensions a 5·83, c 9·88Å., $a:c = 1:1{\cdot}695$; space-group D^{19}_{4h} $I4/amd$. Analyses by two methods by F. A. Gonyer gave CuO 77·94 (78·6 Cu_2O 19·45 (21·38), Fe_2O_3 2·70 (0·00), corresponding to $Cu''_{12}Cu'_4O_{14}$ in the u cell. An oxygen-defect structure is, however, suggested with CuO as the ide

position. When heated the mineral breaks down to a mixture of tenorite cuprite, the X-ray powder photographs being quite distinctive. Specimens lled 'pitchy copper ore' or 'melanochalcite' from several localites, examined X-rays in the hope of finding more paramelaconite, proved to be tenorite or fossite. L. J. S.

COCK (M. A.). *On goethite and lepidocrocite.* Trans. Roy. Soc. Canada, 1942, ser. 3, vol. 36, sect. 4, pp. 107–118, 1 pl.

inute crystals of goethite (α-FeO.OH) from Steeprock Lake, Ontario [M.A.], show *m*(110), *e*(021), *b*(010), *w*(423) ($a : b : c = 0{\cdot}4616 : 1 : 0{\cdot}3034$, X-ray); 587, *b* 9·937, *c* 3·015 Å.; space-group $D_{2h}^{16} = Pbnm$; $\alpha = b$, $\gamma = a$, 2V small, tive, absorption $\gamma > \beta$, dispersion extreme, $r < v$ [M.A. **8**–349]. Tiny plates of locrocite (γ-FeO.OH) from Eiserfeld, near Siegen, Westphalia, are tabular on 0), with *e*(120) and rounded (*h*0*l*) faces near *x*(102) and *d*(506) ($a : b : c =$ 88 : 1 : 0·2448, X-ray); *a* 3·86, *b* 12·50, *c* 3·06 Å.; space-group $D_{2h}^{17} = Aman$; γ (brown to black) = *b*, β (red) = *c*, 2V large, dispersion slight. An angle- e is given for goethite and indexed X-ray powder photographs (1 mm. = $1° \theta$) given for both minerals. M. A. P.

SS (S. T.). *The crystal structure of* Pb_3O_4. Journ. Amer. Chem. Soc., 1943, vol. 65, pp. 1107–1110, 3 figs.

etravalent plumbic ions are co-ordinated with chains of oxygen octahedra, divalent plumbous ions are co-ordinated with three oxygens in the parallel ibic chains. The structure can be considered as built up of PbO_2 and red units. Space-group $P\bar{4}b2$. [M.A. **8**–216.] L. J. S.

TRÖM (Anders) & WESTGREN (A.). *The crystal structure of* Pb_3O_4 *and* $SnPb_2O_4$. Arkiv Kemi, Min. Geol., 1943, vol. 16B, no. 14, 7 pp., 1 fig.

$PbCO_3$ in a molten mixture of $NaNO_3$ and KNO_3 yielded red prisms of tetra- l PbO, thin yellow plates of orthorhombic PbO, and orange-coloured needles tragonal Pb_3O_4. The last gave *a* 8·80, *c* 6·56 Å., with $4Pb_3O_4$ in the cell; pro- e space-group $D_{4h}^{13} = P4/mbc$. Chains of $Pb^{IV}O_4$ octahedra along the *c*-axis ound together by $Pb^{II}O_2$ triangles. Replacing tetravalent lead by tin gave b_2O_4 with *a* 8·72, *c* 6·30 Å. The antimonites $MgSb_2O_4$, $ZnSb_2O_4$, $FeSb_2O_4$, &c., a similar structure. [M.A. **8**–216.] L. J. S.

NER (John W.). *The chemical relationship of cryptomelane (psilomelane), hollandite, and coronadite.* Amer. Min., 1943, vol. 28, pp. 497–506.

yptomelane (*a* 9·82 = 6·95 × √2, *c* 2·86 Å.), hollandite (*a* 6·94, *c* 5·71 Å.), and nadite (*a* 6·95, *c* 5·72 Å.) are isostructural and form isomorphous mixtures. unit-cell contents calculated from published analyses are:

ral formula	...	$Mn^{IV}_{8-(x/2+y/4+z/2)}(Mn^{II},R^{II})_x(K,Na)_y(Ba,Pb)_zO_{16}.(H_2O)_{2-(y+z)}$
comelane	...	$Mn^{IV}_{7\cdot42}(Mn^{II},R^{II})_{0\cdot81}(K,Na)_{0\cdot70}Ba_{0\cdot02}O_{16}.(H_2O)_{1\cdot31}$
ndite	...	$Mn^{IV}_{6\cdot53}(Mn^{II},R^{II})_{2\cdot20}(K,Na)_{0\cdot34}Ba_{0\cdot55}O_{16}.(H_2O)_{1\cdot13}$
nadite	...	$Mn^{IV}_{6\cdot71}(Mn^{II},R^{II})_{1\cdot30}(Pb,Ba)_{1\cdot25}O_{16}.(H_2O)_{0\cdot75}$

ne original romanechite (of A. Lacroix, 1900) is cryptomelane. [M.A. **8**–310. L. J. S.

Byström (Anders) & Mason (Brian). *The crystal structure of braun* $3Mn_2O_3.MnSiO_3$. Arkiv Kemi, Min. Geol., 1943, vol. 16B, no. 15, 8 pp.

Braunite from Långban and Jakobsberg, Sweden, and from Nagpur, In and artificial material (from $MnSO_4$ with Na_2SiO_3 and from Mn_2O_3 with Mn gave a 9·40–9·42, c 18·59–18·72 Å. with $8(3Mn_2O_3.MnSiO_3)$ in the body-ce unit cell. Weissenberg photographs give the most probable space-group D_{4h}^{18}, the arrangement of the oxygen atoms (six around each of 48 Mn atoms, and around the remaining 8 Mn atoms counterbalanced by eight 4-co-ordinat atoms) suggests D_{2d}^{10}. [M.A. **4**–461, **7**–354.] L. J. S.

Schumb (Walter C.) & Rittner (Edmund S.). *Polymorphism of bismuth trio* Journ. Amer. Chem. Soc., 1943, vol. 65, pp. 1055–1060.

Monoclinic α-Bi_2O_3 is transformed into tetragonal β-Bi_2O_3 at 710°. A nev stable γ-Bi_2O_3, is body-centred cubic with a 10·245 Å. L. J. S.

Aurivillius (Bengt). *An X-ray investigation of the systems CaO–Bi_2O_3, S Bi_2O_3, and BaO–Bi_2O_3–O. (Mixed oxides with a defect oxygen lattice.)* Ar Kemi, Min. Geol., 1943, vol. 16A, no. 17, 13 pp., 1 fig.

Some further results are given for the rhombohedral phase of the sy SrO–Bi_2O_3 [M.A. **7**–492], with which CaO–Bi_2O_2 and BaO–Bi_2O_3 seem to isomorphous. A tetragonal phase appears with BaO–Bi_2O_3–O. L. J. S.

Spiegelberg (Per). *X-ray studies on potassium antimonates.* Arkiv Kemi, M Geol., 1940, vol. 14A, no. 5, 12 pp., 1 fig.

Sb_2O_4 and potash fused together in equal proportions, or Sb fused with exc of KNO_3, gave rhombohedral crystals of $KSbO_3$ isomorphous with ilmeni a 6·814 Å., α 46° 20′, $C_{3i}^2 = R\bar{3}$. On prolonged heating at 1000° C. this is chan to a cubic form with a 9·56 Å., $T_h^2 = Pn3$, sp. gr. 4·70, containing $12KSbO_3$ in unit cell. Fusing with excess of Sb_2O_4, or precipitation of $SbCl_5$ with K_2CO_3, g orthorhombic crystals of the probable composition $K_3Sb_5O_{14}$; a 24·24, b 7· c 7·16 Å., probable space-group $D_{2h}^9 = Pcma$ or $C_{2v}^8 = Pca$. L. J. S.

Nikolsky (V. A.) Никольский (В. А.). *A unit cell and the space-group of c manite* $2CaO.3B_2O_3.5H_2O$. Compt. Rend. (Doklady) Acad. Sci. URSS, 19 vol. 28, p. 59.

Colemanite has a 8·72±0·02, b 11·29±0·02, c 6·06±0·04 Å., and assum β 69° 51′, the cell content is $2[2CaO.3B_2O_3.5H_2O]$. The space-group is proba C_{2h}^1. [M.A. **8**–289.] M. H. H.

Sillén (Lars Gunnar) & Nylander (Anna-Lisa). *On the oxygen positions in tu states and molybdates with the scheelite structure.* Arkiv Kemi, Min. Geol., 19 vol. 17A, no. 4, 27 pp., 10 figs.

The parameters of the oxygen atoms and cell dimensions have been redet mined for $CaMoO_4$ a 5·213, c 11·426 Å.; $CaWO_4$ a 5·230, c 11·348 Å.; PbMo a 5·424, c 12·076; and $PbWO_4$ a 5·448, c 12·016 Å.; new oxygen parameters a also given for the corresponding barium and strontium salts. All these substanc

sess the scheelite structure and by assuming that the constituent ions are d spheres the oxygen parameters have been calculated from the observed nges in cell dimensions. The resulting structures have been confirmed by a tial Patterson analysis on $SrMoO_4$ and comparison of observed intensities with se calculated for a range of parameter values. It is concluded that 'the XO_4 :ahedra are not regular but flattened perpendicular to the *c* axis'. F. A. B.

LOV (N. V.) Белов (Н. В.). *New silicate structures.* Compt. Rend. (Doklady) Acad. Sci. URSS, 1942, vol. 37, pp. 139–140.

)f some types of silicate structures only a single example was previously known. apleiite is an example of three-member metasilicate rings $[SiO_3]_3$, like beni- e. Dioptase (C_{3i}^2, *a* 14·6, *c* 7·7 Å.) has, like beryl, six-member metasilicate rings $O_3]_6$, which lie at the vertices of an obtuse rhombohedron connected along the ·is by Cu atoms, and with a ring of $6H_2O$ in the internal cavity; the formula ıg written $Cu_6[Si_6O_{18}].6H_2O$. Ramsayite (hemimorphic C_{2v}^5, *a* 14·6, *b* 8·8, 2 Å., containing $4[Na_2Ti_2Si_2O_9]$) has infinite metasilicate chains $[SiO_3]_\infty$, like oxene. The artificial tetragonal 'Egyptian blue', $CaCu[Si_4O_{10}]$, has a sheet ıcture, like apophyllite. L. J. S.

RATA (K. J.). *Internal structure of silicate minerals that gelatinize with acid.* Amer. Min., 1943, vol. 28, pp. 545–562, 4 figs.

ı list of silicate minerals that gelatinize with acid has been compiled. It is ıted out that those which gelatinize readily are based upon the simpler silicon- ·gen groupings of Bragg's classification. F. A. B.

MURDIE (Howard F.) & FLINT (Einar P.). *X-ray patterns of hydrated calcium silicates.* Journ. Res. Nat. Bur. Standards U.S.A., 1943, vol. 31, pp. 225–228. (R.P. 1560.)

X-ray powder data are tabulated for 15 compounds. [M.A. **7**–283.] L. J. S.

3ST (A.). *Crystal structure of gillespite, $BaFeSi_4O_{10}$.* Amer. Min., 1943, vol. 28, pp. 372–390, 5 figs.

fillespite from Alaska [M.A. **4**–237] and California [M.A. **5**–145] gave identical ay results, the unit cell, *a* 7·495, *c* 16·050 Å., containing four molecules, space- up $D_{4h}^8 = P4/ncc$; sp. gr. 3·390–3·402. It has a silicate sheet structure with ·gen atoms in three kinds of positions and unshared corners of SiO_4 tetrahedra both sides of the sheets. Ba and Fe have 8-fold and 4-fold co-ordinations)ectively. When leached with acid the mineral gives glistening flakes of rated silica, sp. gr. 1·8–2·0, which are still optically uniaxial negative with ·45, but showing only a very faint tetragonal X-ray pattern. L. J. S.

HMOND (W. E.). *Inesite, $Mn_7Ca_2Si_{10}O_{28}(OH)_2.5H_2O$.* Amer. Min., 1942, vol. 27, pp. 563–569, 1 fig.

nesite from Quinault, Washington, gave a unit cell *a* 8·89, *b* 9·14, *c* 12·14 Å., ′° 33½′, β 132° 30′, γ 97° 5½′ which from sp. gr. 3·03 and the analysis [M.A. 65] contains $Mn_7Ca_2Si_{10}O_{28}(OH)_2.5H_2O$. This orientation (not the normal

triclinic setting) with elongation as the *c*-axis and the cleavages as (100) and (0[illegible] is selected to show a relation to the wollastonite group. An angle-table is given [illegible] the crystal-forms based on Scheibe's 1888 goniometric measurements with re[illegible] tion of 180° about the *c*-axis ($a : b : c = 0{\cdot}9700 : 1 : 1{\cdot}3208$, α 87° 42′, β 132° 35[illegible] γ 97° 1′). The mineral is also closely related to high-calcium rhodonite, which [illegible] be considered as a dehydrated inesite. L. J. S[illegible]

Precious Stones

Schlossmacher (K.). *Die Neuauflage 1939 der Bezeichnungsvorschriften [illegible] Edelsteine.* Zentralblatt Min., Abt. A, 1941, pp. 21–24.

The 'B.I.B.O.A.' recommendations for the naming of gemstones [M.A. **6**–1[illegible] were also issued by the Reichsausschuss für Lieferbedingungen (State commit[illegible] for delivery conditions) RAL, 560A in 1935, and a new edition (RAL, 560A[illegible] appeared in 1939. This agrees still more closely with mineralogical nomenclat[illegible] 'Topaz-quartz' and 'quartz-topaz' give place to citrine. The grading of ru[illegible] according to colour and quality as Burma, Siam, and Ceylon rubies (for fin[illegible] brownish, and pale coloured stones respectively) is deprecated, though such term[illegible] as Burma-coloured ruby, &c., might be permissible. Stones that have undergo[illegible] colour changes by heating or irradiation may be regarded as genuine, but tho[illegible] coloured by chemical means must be stated to have been artificially coloured. L. J. S[illegible]

Roush (G. A.). *Precious and semi-precious stones.* The mineral industry durin[illegible] 1941, New York & London, 1942, pp. 463–483.

Continuation of annual review with statistics. Diamond predominates: infor[illegible] mation about four other gemstones occupies only one page. L. J. S.

Gordon (W. T.). *The chemistry of gemstones.* Endeavour, London (Imp. Chem[illegible] Ind.), 1943, vol. 2, pp. 99–104, 9 figs.

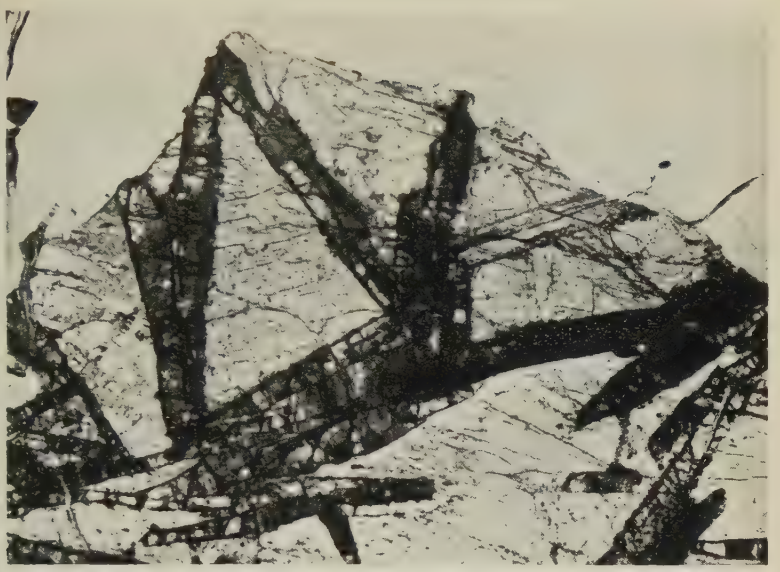
A short popular article with very effective coloured illustrations of groups [illegible] faceted stones and boules of artificial corundum and spinel. L. J. S.

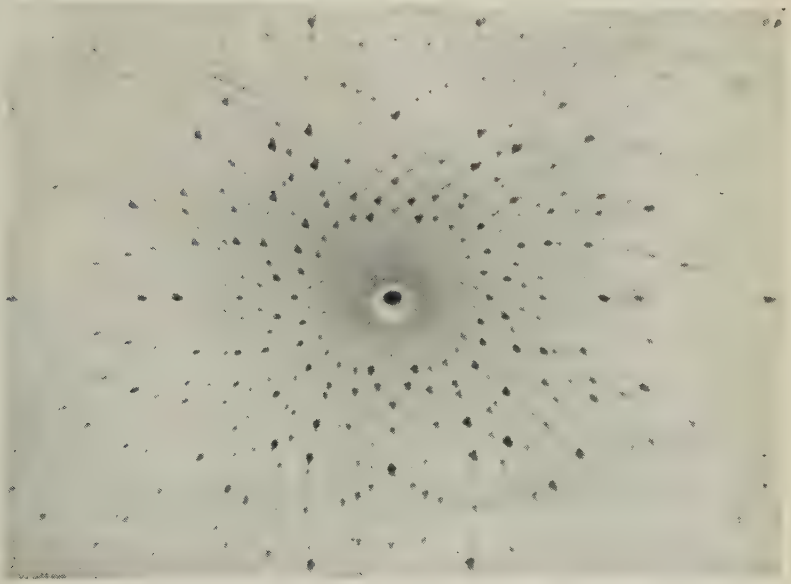
Michel (H.). *Ringsteine und Dosen aus dem Naturhistorischen Museum in Wie[illegible]* Mitt. Wiener Min. Gesell., 1941, no. 107 *in* Min. Petr. Mitt. (Tschermak[illegible] 1941, vol. 53, pp. 87–90.

The court mineral cabinet in Vienna was founded in 1748 with the collectio[illegible] of Chevalier Baillou (1684–1758) of Florence, who became the first curator. [illegible] contained 30,000 specimens, including 35 drawers of gemstones and rings. Sever[illegible] other old collections containing rings and boxes were later incorporated. L. J. S.

Beck (Horace C.). *The beads from Taxila.* Mem. Archaeol. Surv. India, 194[illegible] no. 65, 66 pp., 12 pls. Price *Rs.* 5–6 or 8*s.* 6*d.*

The materials of a large collection of beads, dating from *c.* 700 B.C. to *c.* A.D. 50[illegible] from excavations in the ruined city of Taxila, Punjab, include etched agate an[illegible]





W. Campbell Smith, F. A. Bannister, and M. H. Hey: Banalsite, a new barium-felspar

nelian (the pattern painted on with strong alkali and then heated), glazed
ırtz, amethyst, jasper, malachite, lapis-lazuli, garnet, beryl, glass, pottery, &c.
ıds of European origin reached India in the fifth century B.C. L. J. S.

BERTSON (*Sir* Robert). *Diamond.* Jubilee memorial lecture. Chemistry and Industry (Soc. Chem. Ind. London), 1944, vol. 63, pp. 18–24, 11 figs. Reprinted in Journ. Gemmology, Watchmaker, Jeweller & Silversmith, 1944, vol. 70, pp. 137–139, 199–201, 259–262, 319–320, 12 figs.

A review of recent work on infra-red, ultra-violet, Raman, and X-ray absorpıs; various other physical properties; effect of light and photo-electric con-tivity; artificial production and industrial uses. L. J. S.

EMAYNE (Arthur). *Diamonds: from jewels to tools.* London (N.A.G. Press), [1943], 63 pp., 25 figs. Price 6*d.*

A popular, well-written pamphlet giving details of the mining, marketing, and hioning of diamond and its use as gems and tools. It would make a good pter for a book on precious stones. Some interesting historical details are en. L. J. S.

MAN (C. V.). *The physics of the diamond.* Current Sci. Bangalore, 1942, vol. 11, pp. 261–268, 3 figs.

A popular article giving a summary of the work carried out by the author and collaborators on the absorption spectra, fluorescence, and X-ray phenomena diamond [M.A. 8–268, 280]. Three types of diamond can be distinguished by orption in the ultra-violet. The most transparent kind has a sharp cut-off at 0Å.; the second kind has a clearly marked absorption band at about 2370Å. h feeble transmission at shorter wave-lengths; the third and commonest kind a cut-off at about 3000Å. with subsidiary bands at longer wave-lengths. ne diamonds exhibit simultaneously more than one or even all three types of orption spectra. The author also states that several diamonds of the less nsparent variety in his possession are quite isotropic between crossed nicols, trary to observations recorded by other workers. F. A. B.

LL (Sydney H.). *The diamond industry in 1941.* Jewelers' Circular-Keystone, New York, 1942, reprint 24 pp., 1 fig. (map).
– *The diamond industry in 1942.* Ibid., 1943, 19 pp., 1 fig. (map).

A continuation of annual reports [M.A. 8–268] giving a review of production trading. The world production in 1941 is given as 9,104,958 carats (1·821 ric tons) and in 1942 as 9,254,200 carats. All was from alluvial deposits, and bulk was of industrial stones from Belgian Congo. L. J. S.

nposium on diamonds. Amer. Min., 1943, vol. 28, pp. 141–150.
AUS (Edward H.). *Introductory statement* (p. 141).
LL (Sydney H.). *Diamond production* (pp. 141–143).
PLAN (Lazare). *Gem diamonds and their present trends* (pp. 143–145).
YNE (Alexander). *Diamond dies* (pp. 145–148, 5 figs.).

Slawson (Chester B.). *Diamond-set tools* (pp. 148–149).
Klein (A. A.). *Recent development of bonded diamond wheels* (pp. 149–150).

Supplementary to previous notes [M.A. **8**–267]. The world production fell fr 14¼ million carats in 1940 to 9⅓ in 1941, and 94% came from equatorial Af (58% from Beceka mine, Belgian Congo). There is an increasing demand industrial diamonds and improvements in their application. L. J. S.

Grodzinki (Paul). *Hardness differences in diamond.* Industrial Diamond Re (Supplement to the Gemmologist, London), 1943, vol. 3, pp. 7–11, 4 fi
—— *II. Scientific hardness theory.* Ibid., pp. 13–16, 6 figs.

The hardness of diamond is considered in relation to: (*a*) that of other miner (*b*) differences between diamonds from various localities; (*c*) differences in var directions in the crystal; and (*d*) 'skin' hardness. Under (*b*) the results o Karpinski (1930) and of C. E. Wooddell (1935) are critically examined, and u (*c*) those of Kraus and Slawson [M.A. **7**–519] in relation to the crystal-struct The evidence for differences in (*b*) and (*d*) is inconclusive. L. J. S.

Anderson (B. W.). *Absorption and luminescence in diamond.* Gemmologi London, 1943, vol. 12, pp. 21–22, 25–27, 33–35, 2 figs.

The band 4155 Å. in the absorption spectra of a series of 25 Angola diamo ('Cape' series) shows increasing intensity with the depth of colour (from almo colourless to straw-yellow). Some other bands are also noted. They are not sho by all yellow ('fancy') diamonds, and the colour of the former is perhaps due a lattice effect rather than to the presence of impurities. The same bands a shown in the fluorescence spectra. Diamonds of the 'Cape' series give a bl fluorescence; brown diamonds with green fluorescence show 5040 Å. and so other bands; while bright yellow diamonds with yellow fluorescence show distinct bands. The absorption and fluorescence spectra are compared with th of ruby (here due to Cr.). Enstatite from Kimberley shows a strong absorpti band 5060 Å. L. J. S.

Klüppelberg (E.). *Die Prüfung von Brillantsschliffen des Diamanten dur innere Spiegelungen.* Neues Jahrb. Min., Abt. A, 1940, vol. 76, pp. 71–9 19 figs.

When a brilliant-cut diamond is viewed sideways parallel to the table a patte of light areas is seen, due to internal reflections. Different patterns are shown i the different types of brilliant-cut [M.A. **7**–518], and they afford a check on t correctness of the cutting. The paths of the reflected rays are worked out graph cally and the angles tabulated for a four-point stone. L. J. S.

Eppler (W. Fr.). *II. Beitrag zum Brillanzproblem.* Zentralblatt Min., Abt. 1940, pp. 93–96, 1 fig. [M.A. **7**–518.]

The light reflected out from brilliant-cut diamond has usually been consider only for incident rays normal to the table facet, but oblique rays are also importance. It is shown that much less light is lost for different angles of oblig illumination with the Tolkowsky and 'practical' types than with the 'ide brilliant-cut. L. J. S.

YSER (J. Ferdinand). *The micro topography of the facets of industrial diamonds.* Industrial Diamond Review, 1944, vol. 4, pp. 2–3, 7 figs.

– *The microtopography of diamonds and sapphire surfaces.* Ibid., pp. 72–75, 10 figs.

hotomicrographs (×200) taken under different illuminations are given of the res on a natural octahedral face of diamond. A glass plate inclined at $1\frac{1}{2}°$ to surface gives in sodium-light sharp interference fringes, the contours of which cate that the figures are depressions. L. J. S.

EY (D. P.). *Lattice constant of diamond and the C–C single bond.* Nature, London, 1944, vol. 153, pp. 587–588.

owder photographs of diamond taken in a 19 cm. diameter camera yield high le reflections when Co, Fe, or Mn radiation is employed. The resulting value the spacing of diamond 3·5597±0·0001kX at 18° C. is in excellent agreement ı that of K. Lonsdale [M.A. **9**–40] and yields the C–C bond length 1·5445±)01Å. F. A. B.

OSTER (Nora). *Orientation of diamonds by X-rays.* Industrial Diamond Review, 1943, vol. 3, pp. 1–3, 2 figs. (Supplement to the Gemmologist, London.)

special crystal-holder on the Wooster-Martin ionization spectrometer [M.A. 48] enables the orientation of the crystal to be found. L. J. S.

AFRANOVSKY (I. I.)] Шафрановский (И.И.) SCHAFRANOWSKI (I. I.). *Ergebnisse der statistischen Untersuchungen der gerundeten Ural-Diamanten.* Compt. Rend. (Doklady) Acad. Sci. URSS, 1941, vol. 31, pp. 791–793, 1 fig.

urther notes on a previous paper. [M.A. **7**–52.] M. H. H.

NER (N. R.). *The diamond deposits of the Gold Coast, with notes on other diamond deposits in West Africa.* Appendix by F. A. BANNISTER, *The crystal form of diamonds from the Gold Coast.* Bull. Gold Coast Geol. Surv., 1943, no. 12, 52 pp., 7 pls. (5 maps). Price 3*s*.

here are two principal alluvial diamond fields in the Gold Coast, the major in the gravels of the Birim valley some 60–80 miles NW. of Accra, the lesser in the Bonsa valley SW. of Tarkwa. Production during the period 1920–40 lled 14,891,041 ct., value £7,961,853, and in recent pre-war years has ranged ı 1,400,000 to 1,500,000 ct., the country being the second largest producer of nonds by weight and fourth or fifth by value. The stones are small, averaging ut 35 to the carat, the largest reported from the above fields being $4\frac{1}{2}$ ct. ger diamonds, including one of $10\frac{1}{2}$ ct., have been obtained from the gravels he White Volta river near Gambaga, Northern Territories. The production ains a relatively high proportion of bort (30–60%) and of brown, grey, and green stones. Diamonds occur in Birrimian (pre-Cambrian) greywacke and llite, but their primary source is yet unknown. F. A. Bannister, in an appen- on the crystal form of the stones, tentatively suggests their derivation from nickel-iron core of the earth in early geological times. No mention is made of

the author's previously reported discovery of diamond in chromium-rich later an occurrence of possible genetic significance [M.A. **6**–495]. Brief notes on diamonds of Sierra Leone, Liberia, French West Africa, French Equator Africa, and Nigeria summarize previous literature. [M.A. **1**–16; **3**–28, **5**–399; **6**–494.] C. F. D.

Caplan (Allan). *Diamonds from Brazil.* Nat. Hist. (Amer. Mus. Nat. Hist.), 19 vol. 49, pp. 268–271, 12 figs.

A series of pictures of the alluvial diamond washings and of diamonds in t matrix. A map shows the diamantiferous localities in the several states. L. J. S.

Oppenheim (Victor). *Diamonds in the northeastern Bolivian Andes.* Econ. Ge 1943, vol. 38, pp. 658–661.

A few diamonds have been found in gravel overlying Permian bed-rock in t valley of Rio Tuichi, Caupolican territory. Natives have reported diamonds f the upper Rio Tequeje and Rio Undumo and other tributaries of the upper B Beni. [M.A. **7**–113.] M. A. P.

Davies (D. A. Bryn). *Report on the geology, gold, and diamond deposits of t Awarapari–Issineru–Putareng area, upper Mazaruni river.* Bull. Geol. Sur Brit. Guiana, 1941, no. 17, iv+30 pp., 2 pls. (maps); with Photograph Supplement, 9 pls. Price 24 cents each.

In addition to alluvial mining, gold is also extracted from quartz veins d covered in 1935 in granitic rocks. A few small diamonds are obtained from alluvi deposits derived from older alluvial deposits, which in turn drew much of the material from the Kaieteurian sandstone formation. L. J. S.

Bannister (F. A.) & Lonsdale (K.). *Laboratory synthesis of diamond.* Natur London, 1943, vol. 151, pp. 334–335.

A preliminary note on the diamonds made by J. B. Hannay in 1879–80. [Mi Mag. **26**–315.]

Desch (C. H.). *Artificial production of diamonds.* Nature, London, 1943, vol. 15 pp. 148–149.

A review of the experiments of Moissan, Parsons, and Hannay. [Min. Ma **26**–315; M.A. **4**–68.] L. J. S.

Rayleigh (*Lord*). *Laboratory synthesis of diamond.* Nature, London, 1943, vo 151, p. 394.

—— *J. B. Hannay and the artificial production of diamonds.* Ibid., 1943, vol. 15 p. 597.

Travers (M. W.). *J. B. Hannay and the artificial production of diamonds.* Ibid 1943, vol. 152, p. 726.

French (James Weir). *Ditto.* Ibid., 1944, vol. 153, p. 112.

Discrediting and crediting Hannay's work. L. J. S.

ISDALE (Kathleen). *Diamonds, natural and artificial.* Nature, London, 1944, vol. 153, pp. 669–672, 3 figs.

ubstance of a lecture at the Royal Institution. A review is given of the physi- and X-ray properties with distinctions between the two types of diamond. rk on the artificial production is reviewed. [Min. Mag. **26**–315.] L. J. S.

ISAR (B. V.). *The polarization of luminescence of ruby.* Physical Rev. (Amer. Phys. Soc.), 1941, ser. 2, vol. 60, p. 616.

he two intense red lines (λ 6927 and 6947 Å.) in the fluorescence spectrum of ficial ruby are due almost entirely (95 %) to vibrations perpendicular to the c axis [i.e. the ordinary ray]. The dichroism with a band in the green-yellow 300–5800 Å.) is also due to the greater absorption of rays vibrating in the same ction. Hence the best colour of the stone and the most intense fluorescence seen on the basal plane. It is suggested that these two phenomena are related eason of chromium atoms replacing aluminium atoms along the optic axis in lattice. L. J. S.

VI (Anna). *Fluorescence, absorption and scattering of light in ruby.* Proc. Indian Acad. Sci., Sect. A, 1942, vol. 15, pp. 52–64, 2 pls.

he Raman lines in the lattice spectrum of alumina are noted. Fluorescence absorption (ω and ϵ) spectra are given for ruby. L. J. S.

OMYATNIKOV (F. V.). *Industrial production of synthetic rubies and sapphires in U.S.S.R.* Gemmologist, London, 1943, vol. 13, pp. 1–2.

bridged translation from the Russian. [M.A. **8**–269.] L. J. S.

ALUN (Max). *Emeraudes et béryls.* Bull. Soc. Roy. Géogr. Égypte, 1943, vol. 21, pp. 51–60.

brief general account, with a review of the literature on the emerald mines gypt. The ancient Egyptian name 'mafek' included also other greenish-blue es (turquoise and copper carbonates). L. J. S.

ERS (Austin F.) & SPERISEN (Francis J.). *American synthetic emerald.* Amer. Min., 1942, vol. 27, pp. 762–768, 10 figs.

F. Chatham of San Francisco produced colourless beryl in 1930 and emerald 935. The process is not divulged. Crusts of short-prismatic crystals ($2\frac{1}{2}$– m.) show also a few colourless crystals of phenakite. The crystals (*c m a*) v zonal growth and a division into sectors. Sp. gr. 2·667, ϵ 1·573, ω 1·578 (Na). ters of dark-red isotropic crystals (not identified) and wisps of liquid-gas ties are present as inclusions. Analysis gave SiO_2 64·30, TiO_2 0·05, Al_2O_3 5, BeO 13·20, Cr_2O_3 2·00, Fe_2O_3 0·30, MgO 0·10, CaO 0·73, Na_2O 0·56, K_2O , H_2O 0·14 = 100·24. Spectrographic analysis shows also a trace of copper. rald from Colombia has negative-crystal cavities and liquid inclusions with s bubble and a cube of halite. [M.A. **8**–269, 270.] L. J. S.

Ingerson (Earl) & Barksdale (Julian D.). *Iridescent garnet from the Adela mining district, Nevada.* Amer. Min., 1943, vol. 28, pp. 303–312, 1 col. 9 text-figs.

Honey-yellow to dark-brown garnet (sp. gr. 3·50–3·64, *n* 1·81) occurs in a c bonate bed in contact with granodiorite. CaO 23, Fe_2O_3 28·5%, with some F indicate a predominance of the grossular molecule. A zonal banding (110) superimposed by a fine herring-bone polysynthetic twinning (111). The r intense bands of iridescent colours are shown when the twin-lamellae are 0 mm. thick, and no colour is shown when they are 0·015 mm. Heated at 106 the birefringence begins to be weakened, and at 1225° much of the garnet is br up into spinel and pseudowollastonite, but the pattern and iridescence are changed. At 1250° the material melts. L. J. S.

Foster (Mark M.). *An observation on the play of color in fire opal.* Rocks a Minerals, Peekskill, N.Y., 1942, vol. 17, pp. 100–101.

Observations on fire opal [from Virgin Valley, Nevada] during the course several years' experience in the field led the writer to suspect that iridesce might be due to inclusions of films of metallic oxides and not to water as is usua supposed. An analysis showed the presence of Fe, Al, Ca, and Mg with trace Au, Ag, Na, K, and Mn. J. M. S.

Hoffmann (Siegfried). *Untersuchungen über den Opalgehalt der Achate.* Ne Jahrb. Min., Abt. A, 1942, vol. 77, pp. 238–276, 2 pls., 3 text-figs.

Two types of agate are distinguished: (A) with slight or moderate turbidi and good translucency, short and finely fibrous structure; (B) turbid, milk-whi and opaque, with long and coarsely fibrous structure. The sp. gr. (2·569–2·60 loss on ignition (H_2O 1·10–1·84%), and artificial colouring were determined f many specimens in different bands. B has low sp. gr. and not high water-conte and cannot be coloured; the low sp. gr. being here due to pores too small for t colouring matter to penetrate. In A some bands can be coloured, others not; t former have higher sp. gr. and less water. The capability of colouring is thus n due to the presence of opal, but depends on the porosity of the material. Wat is only partly due to opal, and is largely present as fine inclusions in quar Solubility tests on powdered quartz and opal in HF and NaOH solutions do n distinguish these minerals. The presence of small amounts of opal could not determined by X-rays: the intensity of the lines due to quartz is not appreciab diminished with less than 40% of opal in the mixture. The only estima made of the amount of opal present is calculated from the sp. gr., and is given 6–7%. Bands which previously took no colouring when heated in an autocla at 480° C. and 473 atmospheres became more porous and lower in sp. gr., and cou then be coloured. L. J. S.

Pearl (Richard M.). *Chalcedony in Colorado.* The Mineralogist, Portland, Orego 1942, vol. 10, pp. 7–8, 29–30, 75–76, 98–99.

Localities of chalcedony suitable for polishing are listed under the headin agate, bloodstone, chalcedony proper, chrysoprase, jasper, petrified wood, plasm prase, and sardonyx. Bibliographical references are given. J. M. S.

NMER (E. J. E.). *Blue John: some notes on its occurrence and ornamental uses.* Sheffield (J. W. Northend), 1940, 8 pp., 4 pls.

'he use of this variety of fluor as an ornamental stone dates from about 1760. ' making of vases began about 1770. The veins from which several varieties Blue John' have been obtained are all in Treak Cliff near Castleton, Derby- 'e. Material from each vein has a characteristic pattern and proportion of ple and white. It is stated that 'if a piece of the blue-purple variety is strongly ted it changes to pink-purple and, if the heating is continued, the purple)ur disappears, leaving the stone white or in some cases a rusty brown'.

W. C. S.

:R (L. A. N.). *Indian precious stones.* Bulletins of Economic Minerals, no. 6, Rec. Geol. Surv. India, 1942, vol. 76, 54 pp., 2 pls. Price *R.* 1 = 1*s.* 6*d.* [M.A. **8**–246.]

n account of occurrences of gem minerals in India, Burma, and Ceylon, sum- rized from standard text-books and other published literature. Some addi- al information is given on the Mogok 'stone tract' where the author was aged on the production of the Geological Survey maps. No statistics of output included. In a paragraph on industrial diamonds, the author states 'powdered ies could be used for polishing diamonds. They are also used for aeroplane ons'!

C. F. D.

N (A. C. D.). *The gems of Burma.* Gemmologist, London, 1943, vol. 12, pp. 37–40, 44, 3 figs.

)escription of gem material in the author's collection, with mention of localities he Mogok region. Species mentioned are: corundum (ruby and sapphire), el, topaz, beryl (aquamarine), olivine, tourmaline, chrysoberyl, diopside, en- ite, scapolite, danburite, moonstone, apatite, garnet, cordierite, kyanite, olite, quartz, andalusite, lapis-lazuli, and sodalite.

L. J. S.

OEWE (Walter H.). *Kansas amber.* Trans. Kansas Acad. Sci., 1942, vol. 45, p. 262.

ale brown amber, in pieces the size of a pea up to 4 inches, occurs in Cretaceous le with coal, pyrite, and gypsum on the banks of the Smoky Hill river in worth Co. Sp. gr. just over 1, H. 3. It shows a brilliant blue-green fluores- ce in ultra-violet light, burns with a smoky flame, and 38% is soluble in roform. This has been previously described under the names kansasite and ite [M.A. **7**–265].

L. J. S.

Miscellaneous

RBLE (John Putnam) & GLASS (Jewell J.). *Some new data on thortveitite.* Amer. Min., 1942, vol. 27, pp. 696–698.

ew chemical and optical data are given for the mineral from the original dike, and, southern Norway, recently reopened. Chemical analysis on grey-green matic crystals, sp. gr. 3·58, α 1·751, β 1·789, γ 1·803, 2V negative, calculated

60–65°, gives SiO_2 45·79, TiO_2 <0·01, Al_2O_3 4·95, Fe_2O_3 2·95, Sc_2O_3 34·5 La_2O_3 &c. (?) 1·48, Yt_2O_3 &c. 9·52, ThO_2 0·09, MnO 0·53, MgO 0·17, CaO 0·2 H_2O- 0·07 = 100·11. F. A. B.

Minguzzi (Carlo). *Sulla non identità della juxporite con la pectolite.* Zeits. Kr 1942, vol. 104, pp. 417–424, 1 fig.

The identity of yuksporite [M.A. **3**–111] with pectolite has been suggested some German text-books. Pink fibrous material from Yukspor, Kola, is optic positive with negative elongation, and α 1·652, γ 1·650 are greater than f pectolite [M.A. **5**–518]. Indexed X-ray powder photographs of the two a distinct; for yuksporite b 7·12 Å., and for pectolite b 7·08 Å. From two publis analyses [M.A. **3**–112], after deducting sphene, formulae are deduced $H_4Na_4Ca_3Al_2Si_5O_{20}$ and $H_6Na_4Ca_3Si_9O_{26}$, as distinct from that of pectol $(HNaCa_2(SiO_3)_3)$. L. J. S.

Anderson (W.) & Smythe (J. A.). *An occurrence of millerite in the Durham C Measures.* Geol. Mag. Hertford, 1942, vol. 79, pp. 220–224, 1 fig.

Tufts of slender acicular millerite occur in an open joint in an ankerite-cemente sandstone, encountered in a bore at Green's farm, 3 miles SW. of Newcastle-up Tyne. Comparable occurrences from the coal-fields of Ayrshire, South Wales, an Kladno in Bohemia are mentioned. [M.A. **4**–84, **7**–336.] C. F. D.

Parker (Robert L.). *Daten zur Kristallographie des schweizerischen Adular* Schweiz. Min. Petr. Mitt., 1942, vol. 22, pp. 271–299, 10 figs.

A review is given of the literature on adularia from Swiss localities, with a lon list of crystal-forms and description of the twinning. L. J. S.

Wasserstein (B.). *Note on nickeliferous pyrite from the Leeuwpoort tin min* Trans. Geol. Soc. South Africa, 1942, vol. 44 (for 1941), pp. 35–37, 2 pls.

Pyrite, etched with HCl and zinc, shows zoning, due probably to variatio in a small nickel content. Pseudomorphs of goethite have a similar structure. E. D. M.

Mir (Jesús). *Determinación mineralógica de las sales potásicas.* Notas y Comuni Inst. Geol. Minero de España, 1942, no. 10, pp. 125–157, 1 pl., 14 text-fig

Optical data for a number of minerals occurring in potash-salt deposits ar tabulated and represented on a graph together with the refractive indices of range of liquids. L. J. S.

Milton (Charles), Murata (K. J.), & Knechtel (M. M.). *Weinschenkite, yttriu phosphate dihydrate, from Virginia.* Amer. Min., 1944, vol. 29, pp. 92–10 5 figs.

Minute (<1 mm.) white rosettes of fibres occur on the surface of manganiferou limonite in clay from the weathering of Cambrian dolomite in Kelly Bank min Vesuvius, Rockbridge Co. Sp. gr. 3·263, α 1·605, β 1·612, γ 1·645, $\alpha = b$, $\gamma : c =$ 35°, and X-ray data correspond closely with those for the Bavarian miner

.A. 2–12, 522; 8–368] and the artificial product. Spectrographic analysis shows predominating with Yb, Er, Dy, Gd, and minor amounts of Nd, Sm, Eu, Ho, i, La. Mean atomic weight of rare-earths 104·5. There is a rapid loss of water 180°, suggesting the formation of the hemihydrate. The associated clay con- ns 0·08 and the ash of chestnut leaves from the locality 1·29% Yt_2O_3 (none in : leaves). A biochemical concentration of rare-earths is suggested. L. J. S.

DSON (Douglas Rennie). *Natural mineral amalgams.* Metallurgia, Manchester, 1943, vol. 29, pp. 53–60, 4 figs.

A detailed review is given of the literature on native amalgams of Ag, Au, and and on artificial products ('Arbor Dianae') with reference to the system -Hg. Silver amalgams fall into two groups: the α form containing up to 55% , of variable composition, face-centred cubic (silver lattice), malleable and tile, which is called mercurial silver; the γ form, Ag_3Hg_4 (Ag 28·74%), body- tred cubic, brittle, which is named argental (Cordier, 1802) or landsbergite. A. 7–224.] L. J. S.

MDOHR (Paul) & WEBSKY (Carol v.). *Wurtzitkristalle und Zwillinge.* Neues Jahrb. Min. Monatshefte, Abt. A, 1943, pp. 65–71, 3 figs.

Vell-developed, pale brown to almost colourless crystals of wurtzite occur in ities of the lead-zinc ore of the Kirka mine, Dedeagatch, Thrace. They have form of hexagonal pyramids with large basal plane at one end. Five new stal-forms are noted in the horizontally striated pyramid zones. Twinned regates have a pseudo-cubic aspect, eight crystals being grouped with their al planes approximately in the position of octahedral faces, or four crystals h basal planes approximately in the position of tetrahedral faces [M.A. 7–508]. material is strongly triboluminescent, fluorescent in ultra-violet rays, and sphorescent (resembling the blende from Tsumeb). L. J. S.

IGER (J. v.) & BAYRAMGIL (O.). *Ein ungewöhnliches Vorkommen von Turmalin in der Erzlagerstätte von Işikdağ (Türkei).* Schweiz. Min. Petr. Mitt., 1943, vol. 23, pp. 615–616.

white, earthy, friable mineral, suggesting a decomposition product, shows er the microscope a matted aggregate of white scales and fine needles with 320, ω 1·642, sp. gr. 3·135. X-ray powder photographs agree with tourmaline, analysis with magnesium-rich dravite: SiO_2 35·75, Ti_2O_3 0·22, B_2O_3 10·59, O_3 34·77, rare-earths 0·27, FeO 2·15, MnO 0·20, MgO 8·46, CaO 1·71, Na_2O 1·74,) 0·37, H_2O+ 3·75, F nil = 99·98; formula $(Na,K)_2Ca[(Fe,Mn)Mg_6Al_{20}]$ $B_9O_{31}(OH)_{12}$. The mineral is of hydrothermal origin, and the boron derived n clayey sediments (not limestone). L. J. S.

KOVA (V. S.) БЫКОВА (В. С.). *Chemical composition of the Lovozero loparite and a method for its analysis.* Compt. Rend. (Doklady) Acad. Sci. URSS, 1941, vol. 33, pp. 136–139.

ive detailed and eight partial analyses are given of loparite [M.A. 3–275;

8–29, 223, 341] isolated from different rocks (lujavrite, upper and lower horiz of urtite, malignite, and pegmatite) in order to determine the richest sourc niobium and rare-earths. Material from malignite on Mt. Vavnbed gave (fig in brackets the extreme values shown by all analyses): SiO_2 0·30 (0·30–0·7 TiO_2 40·20 (39·65–40·70), ZrO_2 nil (nil), Nb_2O_5 8·87 (7·80–13·20), Ta_2O_5 (0·62–0·75), ThO_2 0·64 (0·62–0·76), Ce_2O_3 16·37 (16·04–17·50), Ce earths 1 (14·76–16·00), Yt earths nil (nil), Al_2O_3 0·20 (0·14–0·20), Fe_2O_3+FeO 0·36 (0·3 0·72), MnO nil (nil), MgO nil (nil), CaO 5·30 (4·82–5·46), SrO 3·14 (2·00–3·1 Na_2O 8·10 (8·10–8·50), K_2O 0·28 (0·13–0·28), P_2O_5—(0·02), F—(0·03), ign. (0·20–0·64), total 100·25; sp. gr. 4·77 (4·69–4·82). A formula is not given. X-r spectral analysis of the rare-earths separated from loparite from urtite ga La_2O_3 9, Ce_2O_3 15, Pr_2O_3 3, Nd_2O_3 5, Sm_2O_3 0·7, Eu_2O_3 0·05, Gd_2O_3 0·5, Tb_2O_3 Dy_2O_3 0·3, Ho_2O_3 0·02, Er_2O_3 0·05, Tu_2O_3 0·02, Yb_2O_3 0·03, Yt_2O_3 0·05%.

L. J. S.

Chronic pulmonary disease in South Wales coalminers. II. Environmental stud Special Report Series Medical Research Council, London, 1943, no. 2 222 pp., 9 pls. Price 10*s.* 6*d.*

In accompaniment of a medical survey on pneumokoniosis of miners in So Wales anthracite and bituminous coal mines, various physical, mineralogical, a petrographical 'environmental studies' have been made and are reported on this volume. The contributions of mineralogical interest are: 'The composit of the air-borne dusts at the coal-face in certain mines' by G. Nagelschmidt (p 95–124); 'The petrology of coal-measures, shales and sandstones from six selec collieries in the South Wales Coalfield' by A. Brammall, and John G. C. Lee (pp. 125–152); and 'The chemical and X-ray diffraction analysis of the roof a clod of some South Wales seams, and of the mineral matter in the coal' D. Hicks and G. Nagelschmidt (pp. 153–186). Micaceous matter in the dust a in the shales, previously known as 'sericite' or 'hydromuscovite', is identified illite. Soda-illite (brammallite) occurs as a micaceous veneer on joint- and she planes in shale [Min. Mag. **26**–297, 304]. Many chemical analyses are given the roof and clod shales and of the dust, as well as of various mineral fractio separated from these. The mine dusts, investigated after ashing at 380° C., c sist dominantly of kaolin and carbonates (both derived from the mineral mat of the coal seams), illite and quartz (both supplied from the associated shale

C. F. D.

Kerr (Paul F.) & Erichsen (Alberto I.). *Origin of the quartz deposit at Faze Pacú, Brazil.* Amer. Min., 1942, vol. 27, pp. 487–499, 10 figs.

Fazenda Pacú in central Minas Geraes, 85 miles NW. of Belo Horizonte, is t most productive deposit of large clear α-quartz crystals in Brazil. The qua occurs in veins along a fracture zone at a contact between Archaean granite a Silurian shales, the granite and the matrix of the crystalline vein-quartz being decomposed to kaolinite that the mineral can readily be worked in open pits to 50 feet deep. There are also important detrital (boulder-bed) deposits, deriv from these veins. The veins are probably of hypogene origin, deposited fr solutions which may have yielded pegmatite in depth. Among crystals not

1 other localities in Minas Geraes is one from Ariranha, Pavao, Teofilo Otoni icipality, 7 feet 2 inches high, 11 feet 2 inches in circumference, and weighing e than 5 tons; and another, probably from the Diamantina district, which bits undigested inclusions of bedded itacolumite. C. F. D.

GUSON (R. B.). *Muscovite from Mattawan township, Nipissing district, Ontario.* Univ. Toronto Studies, Geol. Ser., 1943, no. 48, pp. 31–41, 6 figs.

ear muscovite (sp. gr. 2·84, 2·85) in sheets up to 6×8 feet, in a pegmatite in the Purdy pit, shows gliding planes λ and $\mu \parallel [010]$, $\nu \parallel [310]$. α (acute : $c[001] = +5°\ 27'–5°\ 50'$ ($\alpha : c(001) = -57'-34'$), $\gamma \parallel b[010]$; α 1·566, 7, β 1·605, 1·606, γ 1·610, 1·611, 2V 41° 28′, 39° 26′ (Na), $r > v$, absorption $\gamma > \alpha$. The unit cell with space-group $C^6_{2h} = C2/c$, a 5·21, b 9·02, c 19·98Å., 3° 36′, contains approximately $4[KAl_2(AlSi_3)O_{10}(OH,F)_2]$. Analysis, SiO_2 6, TiO_2 0·31, Al_2O_3 31·80, Fe_2O_3 2·69, FeO 1·53, MgO 0·92, CaO 0·09, Na_2O , K_2O 10·34, H_2O+ 5·32, H_2O- 0·36, F 0·37, less O for F 0·16 = 99·83. een crystal of muscovite from Lincoln Co., North Carolina, gave space-group = $C2/c$, a 5·20, b 9·03, c 20·04Å., β 84° 6′. M. A. P.

COCK (M. A.) & FERGUSON (R. B.). *The morphology of muscovite in relation to the crystal lattice.* Univ. Toronto Studies, Geol. Ser., 1943, no. 48, pp. 65–82, 6 figs.

evious geometrical settings of muscovite are related to the structural setting ransformation formulae. Old and new goniometric measurements yield $: c = 0·5764 : 1 : 2·2372$; $\beta = 84° 21'$, and the established forms, c(001), 0), n(130), m(110), e(011), y(021), ϵ(112), o(111), $h(\bar{1}12)$, $p(\bar{1}11)$, $x(\bar{1}31)$, for h an angle-table is given; doubtful forms, (032), $(\bar{3}02)$, (221); gliding planes,), (133). A measured twin has the twin-axis [310], composition plane (001), h is the proper statement of the muscovite law. The form-development of covite agrees with the Bravais-Donnay principle and the twin-law is predict- on Friedel's theory. M. A. P.

FIELD (E. W.). *Prehnite from Ashcroft, British Columbia.* Univ. Toronto Studies, Geol. Ser., 1943, no. 48, pp. 49–64, 10 figs.

ssures in peridotite, on the east side of Bonaparte river, are filled with colour- prehnite crystals (up to 5 mm.) with c(001), s(111), m(110), n(104) ($a : b : c =$ 20 : 1 : 3·3817). Sp. gr. 2·915. Optically positive, free from lamellar structure; a) 1·615, β (= b) 1·624, γ (= c) 1·644, 2V 69° (Na); dispersion imperceptible. unit cell with a 4·60, b 5·46, c 18·44Å., space-group $C^4_{2v} = P2cm$, contains ly $2[Ca_2Al_2Si_3O_{10}(OH)_2]$. Analysis, SiO_2 41·67, TiO_2 0·12, Al_2O_3 24·44, $)_3$ 1·03, FeO 0·32, MgO 0·25, CaO 27·25, Na_2O 0·18, K_2O 0·18, H_2O+ 4·44, – 0·00 = 99·88. Crystals of prehnite from Ottawa Co., Quebec, are tabular 001), with m(110), a(100), u(102). Optically positive, with lamellar structure; 619, β 1·627, γ 1·648, 2V 64° (Na); $r < v$ (1°). The morphological crystallo- hy is revised and transformed to the structural setting, and the X-ray powder ern is reproduced (1 mm. = 1° θ) and indexed. M. A. P.

Stevenson (John S.). *Hypogene native arsenic from Criss Creek, British Columb* Univ. Toronto Studies, Geol. Ser., 1943, no. 48, pp. 83–91, 3 figs.

A brecciated vein of ankeritic dolomite in carbonatized argillaceous sedimen 12 miles north of Savona, on Kamloops lake, is cemented with reniform ars which shows lamellar structure and contains 6–10% of antimony as inclu droplets (0·2–1·0 mm.). Analysis gives 8 % Sb, excluding allemontite. The col form texture, the emulsion (exsolution) structure, and the presence of spec graphic boron indicate a low temperature of formation. M. A. P.

Greenwood (Robert). *Effect of chemical impurities on scheelite fluoresce* Econ. Geol., 1943, vol. 38, pp. 56–64, 2 figs.

Spectrographic estimates are given for the relative amounts of 21 minor e ments in 54 specimens of scheelite whose colour of fluorescence ranges from b blue, through white, cream, pale yellow, to chrome-yellow. This colour sequen is asociated with increasing Mo and less definitely with increasing Mn.

M. A. P.

Marsh (Joseph K.). *Rare earths in scheelite.* Journ. Chem. Soc. London, 19 pp. 577–578.

The amount of europium found in scheelite from Forbes reef, Swaziland, only one-twentieth of that reported by Servigne [M.A. **8**–272]. Chemical a spectroscopic analysis gave Eu 25, Sm 25, Pr 10, Tb 10, Dy 80, Er 15, Nd Gd 65×10^{-4} %. The luminescence of the material is compared with that scheelite from other localities. The material shows absorption bands 5850 a 5740Å. for the extraordinary ray, due to neodymium. L. J. S.

Donnay (J. D. H.). *Morphologie cristalline du groupe de la schéelite.* Trans. Ro Soc. Canada, 1942, ser. 3, vol. 36, sect. 4, pp. 37–57, 7 figs.

Using a previously described method of morphological analysis [M.A. **8**–30 306] the space-group and absolute dimensions of the unit cells of wulfenit powellite, stolzite, and scheelite are correctly predicted, without X-ray measur ments, from the available morphological data, compositions, and specific gra ties. For the reciprocal of Avogadro's number $1{\cdot}6603 \times 10^{-24}$ is used [where 1·649 is in common use]. M. A. P.

Jayaraman (N.). *A theoretical discussion of the chemical constitution of garnets revealed by X-ray investigations.* Journ. Indian Inst. Sci., 1940, vol. pp. 61–75.

The empirical formula of the garnets is $R''_3R'''_2Si_3O_{12}$ and the unit cell contain $8[R''_3R'''_2(SiO_4)_3]$. Several published analyses are calculated to the basis of 1 oxygen atoms. Miscibility gaps in the series of garnets appear to be accidenta depending on the materials available in the parent rock. [M.A. **4**–111, **5**–381.]

L. J. S.

MÁN (J.). *Reconocimiento sencillo y rápido de menas de cobalto en pleno campo.* Notas y Comunic. Inst. Geol. Minero de España, 1942, no. 9, pp. 53–64.

simple and rapid field test for cobalt is by heating (with a wax taper) the eral with 'sal espoñola' (equal parts of NaCl and NH_4NO_3) on an aluminium e. A green or blue colour is obtained, which disappears on the addition of a) of water, to reappear when again heated. L. J. S.

YUL (E. V.)] Искюль (E. B.) Isкül (E. V.). *To the mineralogy of platinum and palladium in the Norilsk sulphide ores.* Compt. Rend. (Doklady) Acad. Sci. URSS, 1940, vol. 27, pp. 252–254. [M.A. 8–53, 341.]

YUL (E. V.)] Искюль (E. B.) Isкül (E. V.). *On a finding of valleryite in the Norilsk sulphide ores.* Compt. Rend. (Doklady) Acad. Sci. URSS, 1940, vol. 27, pp. 249–251.

lleriite occurs in the ores intimately associated with chalcopyrite.
M. H. H.

RKOV (I. N.)] Чирков (И. Н.) Tchirkov (I. N.). *Valleriite from vein deposits of sulphide copper-nickel ores of the Manche-tundra.* Compt. Rend. (Doklady) Acad. Sci. URSS, 1941, vol. 31, pp. 472–474, 2 figs.

lleriite occurs with chalcopyrite, rarely with pyrrhotine or replacing pent- ite. M. H. H.

ZYUK (P. A.) Яцюк (П. А.). *The question of the sign of the charge of certain magnesium minerals.* Compt. Rend. (Doklady) Acad. Sci. URSS, 1940, vol. 26, pp. 942–943.

arious specimens of fibrous serpentine and antigorite acquire a positive rical charge in water and dilute acid, whereas olivine, amphibole, talc, rite, muscovite, &c., show a negative charge. The charge on the serpentine rals changes to negative in alkaline solution. F. A. B.

ASHENKO (K. I.) Асташенко (К. И.). *Alunite-bearing secondary quartzites in the central Balkhash region.* Compt. Rend. (Doklady) Acad. Sci. URSS, 1940, vol. 27, pp. 142–146.

number of deposits of alunite-bearing quartzite are described. The alunite sociated with andalusite, with corundum and diaspore, with diaspore and ite, with sericite, or with kaolinite. M. H. H.

KHROV (F. V.) Чухров (Ф. В.). *New data on silver halogenides in Kazakh- stan ore deposits.* Compt. Rend. (Doklady) Acad. Sci. URSS, 1940, vol. 27, pp. 246–248.

; Djelambet, near Shortandy on the Karaganda railway, embolite occurs with na, cerussite, and usually native gold. At Dzhezkazgan, near Karsakpay, ganda district, iodyrite occurs with malachite and atacamite in sandstone. Maikain, near Pavlodar, iodembolite and embolite occur in native sulphur, in jarosite (often with native gold), and in quartz and baryte, with corkite.
M. H. H.

Chukhrov (F. V.) Чухров (Ф. В.). *Some general questions on the origin of silver halide minerals.* Compt. Rend. (Doklady) Acad. Sci. URSS, 1940, vol. 2[illegible] pp. 697–700.

Silver halide minerals are typical of arid regions where the ground-water [illegible] rich in chlorine, &c., which may act on native silver and argentiferous sulphides. At Maikain in central Kazakhstan the ground-water contains Cl 240, Br 0·5 [illegible] per litre. Several analyses are given of iodyrite, iodembolite, embolite, and bromo-cerargyrite from this locality. L. J. S.

Lazarenko (E. K.) Лазаренко (Е. К.). *Silver-bearing tetrahedrite from Nagolnaya Tarasovka in the Donetz basin.* Compt. Rend. (Doklady) Acad. Sci. URSS, 1941, vol. 31, pp. 475–477.

Argentiferous tetrahedrite is fairly common in the ores; crystals show *o*′(1[illegible]1), *o*(111), *d*(110), and *n*(211). Analysis gave S 24·18, Sb 30·21, As 1·8, Cu 36·5[illegible] Fe 4·61, Zn 0·056, Hg 0·005, Ag 3·6, total '100·62', sp. gr. 4·889. Spectrum analysis showed that Pb, Cd, and Ga are also present. M. H. H.

Kaminskaya (Sh. E.) Каминская (Ш. Е.). *Titanium in the principal zonal soils of the European part of the USSR.* Compt. Rend. (Doklady) Acad. Sci. URSS, 1941, vol. 33, pp. 50–53.

Soils of different types contain TiO_2 0·24–0·63%, the largest amount being in those of the laterite type. Extracted soil solutions contain only 7×10^{-6}% indicating the slight mobility of TiO_2. L. J. S.

Miropolsky (L. M.) Миропольский (Л. М.). *Macrofibrous anhydrite in the Chuvash Republic.* Compt. Rend. (Doklady) Acad. Sci. URSS, 1942, vol. 33, pp. 157–158.

Fibrous anhydrite with ash-grey colour and silky lustre occurs with chalcedony, gypsum, and celestine in cavities in dolomite rock of Permian age on the banks of the middle Volga. The fibres have positive elongation, α 1·569, γ 1·616; sp. gr. 2·91–2·935. Analysis gave SO_3 56·63, CaO 39·12, SrO 0·00, BaO 0·00, SiO_2 2·73, $Fe(Al)_2O_3$ 1·06, MgO 0·17, H_2O+ 0·10, H_2O- 0·68. L. J. S.

Miropolsky (L. M.) Миропольский (Л. М.). *On the segregation of secondary quartz in the Lower Permian deposits of Tataria.* Compt. Rend. (Doklady) Acad. Sci. URSS, 1942, vol. 36, pp. 62–65, 3 figs.

Grains of detrital quartz in the carbonate rocks with associated gypsum and anhydrite show secondary growths on their surface, either in optical continuity or as spherulitic growths. Euhedral crystal showing zonal growth are also present. L. J. S.

Melentiev (B. N.). *A rapid method for determining Al_2O_3 in a nepheline concentrate.* Compt. Rend. (Doklady) Acad. Sci. URSS, 1943, vol. 38, pp. 93–95.

Estimation of Al_2O_3 in the fraction of sp. gr $< 2·8$ in the concentrate from the apatite-nepheline dressing plant gives the amount of nepheline present. L. J. S.

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